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Early Western Travels
1748-1846

Volume XVII

Early Western Travels
1748-1846

A Series of Annotated Reprints of some of the best and rarest contemporary volumes of travel, descriptive of the Aborigines and Social and Economic Conditions in the Middle and Far West, during the Period of Early American Settlement

Edited with Notes, Introductions, Index, etc., by

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Editor of "The Jesuit Relations and Allied Documents," "Original Journals of the Lewis and Clark Expedition," "Hennepin's New Discovery," etc.

Volume XVII

Part IV of James's Account of S. H. Long's Expedition
1819-1820

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EXPEDITION FROM PITTSBURGH TO THE ROCKY MOUNTAINS

[PART IV]

[124] CHAPTER I [IX][1]

Journey from Belle Point to Cape Girardeau — Cherokee Indians — Osage War — Regulator's Settlements of White River.

THE opportunity afforded by a few days residence at Fort Smith, was seized for the purpose of ascertaining, by several successive observations, the latitude and longitude of the place. The results of several observations of the sun's meridian altitude, and of lunar distances, had between the 14th and 19th September, give for the latitude of Belle Point, 34° 50′ 54″, and for the longitude 94° 21′ west of Greenwich.[2]

On the 19th, Captain Bell left the fort to proceed on his way to Cape Girardeau,[3] accompanied by Dougherty

[1] Chapter ix in volume iii of the original London edition.

For the following topics mentioned in this chapter, see Nuttall's *Journal*, volume xiii of our series: Massern (note 181), Vache Grasse (164), Cadron (133), Short Mountain (162), Rocky Bayou (158), metif (114), Quapaw Indians (84), Osage-Cherokee hostilities (155), Governor William Clark (105), Governor James Miller (214), Tallantusky (148), Cherokee treaty (145), Point Remove (139), White River Cut-Off (72), Little Rock (123), roads through Arkansas (126), gold and silver in Arkansas (128).— ED.

[2] Later observations give the following results: latitude 35° 23′ 14″; longitude 94° 25′ 52″.— ED.

[3] In the Missouri county of the same name, on the Mississippi, a hundred and forty miles below St. Louis. It is one of the oldest towns in the state. For historical sketch, see André Michaux's *Travels*, in our volume iii, note 154.— ED.

and Oakly, two of the engagees whose services were no longer required. On the 20th, Doctor James and Lieutenant Swift departed in company with Captain Kearny,[4] who had visited the post in the discharge of his duties as inspector and pay-master. It was the design of this party to descend the Arkansa to the Cherokee agency, and to proceed thence to the hot springs of the Washita.

On the 21st, the party, now consisting of Major Long, Messrs. Say, Seymour and Peale, accompanied by Wilson, Adams, Duncan, and Sweney, the other soldiers being left at the fort, commenced their journey towards Cape Girardeau. We took with us five horses and five mules, two of the latter being loaded with packs. Captain Ballard kindly volunteered his services as guide, and, attended by a servant, accompanied us the first day's journey on our march.

[125] Our route lay on the south side of the Arkansa, at considerable distance from the river, and led us across two small creeks — one called the Mussanne or Massern, and the other the Vache Grasse.[5] The latter stream has a course of several miles, but during the dry season,

[4] Stephen W. Kearney (1794-1848), of New Jersey, left his studies in Columbia College at the outbreak of the War of 1812-15, to enter the army as first lieutenant of the Thirteenth Infantry. A year later he was made captain for bravery at Queenstown Heights. Being retained at the close of the war, he was at the beginning of the Mexican War a colonel of dragoons. He led the Army of the West which marched from Bent's Fort to New Mexico, and later assisted in the conquest of California. In 1846 Kearney was breveted major-general, and appointed governor of California. Afterwards, he joined the army in Mexico, and there contracted the disease which resulted in his death.— ED.

[5] The word Masserne, applied by Darby as a name to the hills of the Arkansa territory, near the boundary of Louisiana, and by Nuttall, to the mountains at the sources of the Kiamesha and the Poteau, is supposed to be a corruption of *Mont Cerne*, the name of a small hill near Belle Point, long used as a look-out post by the French hunters.— JAMES.

discharges very little water. The small path we followed lay for the most part through open woods of post oak, black jack, and hickory, occasionally traversing a narrow prairie. In these open plains, now covered with rank grass and weeds, we discovered here and there some traces, such as a skull or a hoof of a bison, indicating that the undisputed possession of man to these regions had been of a very recent date.

It was near five o'clock when we arrived at the solitary cabin of a settler, and though we found no inhabitant about the place, we halted, and encamped near the spring. Our horses were scarce unsaddled, when a man, who seemed to be the occupant of the house, came up, and informed us, that half a mile further on our way, we should find a house and good accommodations. Accordingly, we again mounted our horses, and rode on to "Squire Billingsby's," as our destined host was entitled, where we met a very hospitable reception.[6] As the night approached, we observed that several young women and men, the sons and daughters of the family, disappeared, going to the cottages of the neighbours (the nearest of which seemed to be the one we had passed) to spend the night, that they might leave their beds for our use. Our hospitable landlord had many swarms of bees, some of which had been taken from the neighbouring forests. Wishing to make the addition of some honey to the bountiful table spread for our entertainment, he went with a light, and

[6] "Squire" Billingsley came from middle Tennessee to Arkansas in 1814, and after a year passed at Cadron, settled on the Mulberry, in Franklin County, where he lived two years. When by the terms of the treaty with the Cherokee the white settlers were compelled to abandon this settlement, Billingsley removed to the Vache Grasse. He was a member of the first territorial legislature. See Nuttall's *Journal*, in our volume xiii, note 162.— Ed.

carefully removing the top of one of the hives, took out as much of the comb as he wished, and then replaced the top without killing or injuring the bees. In this manner, he assured us, honey may [126] at any time be taken without destroying the insects, who will, if the season admits, speedily make up the deficiency thus produced. Some feather beds having been given up by their ordinary occupants expressly for our use, we could not well avoid accepting the accommodation thus offered, but instead of proving an indulgence, we found the use of them partook more of the nature of a punishment. We spent an unquiet and almost sleepless night, and arose on the following morning unrefreshed, and with a painful feeling of soreness in our bones, so great a change had the hunter's life produced upon our habits. Those of the party who spread their blankets, and passed the night on the floor of the cabin, rested much more pleasantly.

On the succeeding morning, Captain Ballard returned to Belle Point, and we resumed our journey, accompanied by one of the sons of our landlord, who undertook to guide us on our way, until we should fall in with a path which we might continue to follow. We passed through a hilly country, crossing two creeks, heretofore called the Middle and Lower Vache Grasse. At the distance of four or five miles from the Arkansa, on each side, the country is broken and mountainous, several of the summits rising to an elevation of near two thousand feet above the surface of the water. Several trees which stood near our path had been in part stripped of their bark, and the naked trunks were marked with rude figures, representing horses, men, deer, dogs, &c. These imperfect paintings,

done with charcoal, and sometimes touched with a little vermilion, appeared to be historic records, designed to perpetuate, or at least to communicate the account of some exploit in hunting, a journey, or some similar event. We have already remarked, that this method of communication is sufficiently understood by the Indians, to be made the vehicle of important intelligence.

A little before sunset we arrived at a settlement on the stream, called Short Mountain Bayou. The little [127] cabin we found occupied by two soldiers belonging to the garrison, who were on their return from the settlement at Cadron, whither they had been sent with letters on our arrival at Fort Smith, Cadron being the nearest post-town. We had expected letters from our friends by the return of the express, but were disappointed.[7]

The soldiers informed us, that the house in which they had quartered themselves for the night, had been for a week or two deserted, since its proprietor had died, and his wife, who was sick, had been removed to the nearest settlement. The place is called the Short Mountain Settlement,[8] from a high ridge of sandstone, a little to

[7] Short Mountain Creek rises in south central Logan County, on the slope of the mountain of this name, and pursues a northeasterly course to the Arkansas.

When Fort Smith was first established, mail was brought from Arkansas Post by soldiers detailed for that duty. The trip by water consumed three weeks.— ED.

[8] The deserted house occupied by the soldiers appears to have been the only one in this so-called settlement. There were, however, other settlers not far distant. John Tittsworth and two sons located near Short Mountain as early as 1814. A number of immigrants are said to have come to the county soon after the New Madrid earthquake (1812), and when the Cherokee were placed in possession of the north side of the Arkansas, others came in from that region. See Nuttall's *Journal*, in our volume xiii, note 162.— ED.

the north-west, rising in the form of a parallelogram to an elevation of about twelve hundred feet.[9] Its sides are abrupt, and in many places, particularly towards the summit, perpendicular. The summit is broad and nearly tabular, being covered with small trees, among which the red cedar, or some other ever-green tree, predominates. The plantation is somewhat elevated on a rocky eminence, at a little distance from the creek, but it is surrounded on all sides, save one, by the heavily wooded low grounds, in which we are to look for the causes whose operation have made it so soon desolate. Short Mountain Bayou, if we may judge from the depth and width of its channel, and the extent of its low grounds, is a large stream, or rather one which drains an extensive surface, but at this time it exhibited a succession of green and stagnant pools, connected by a little brook, almost without any perceptible current. On the surface of these pools, we saw the floating leaves of the nymphæa kalmiana, some utricularias, and other aquatic plants.

[128] September, 23d. After leaving the wide and fertile bottoms of the Short Mountain Bayou, our path lay across high and rocky hills, altogether covered with woods. The upland forests are almost exclusively of oak, with some little intermixture of hickory, dogwood and black gum. They are open, and the ground is in part covered with coarse grasses.

At noon we arrived at the Cherokee settlements on Rocky Bayou, and were received with some hospitality at the house of the Metiff chief, known by the name of

[9] It may be proper to remark, that the elevation of none of the Ozark mountains having been ascertained, the estimates which we have made are only to be considered as approximating towards the truth.— JAMES.

Tom Graves. Though entirely an Indian in his character and habits, he has the colour and features of an European, and it was not without some difficulty we could be made to believe that he was in reality allied by birth to the people among whom he holds the rank of a chief. His house, as well as many we passed before we arrived at it, is constructed like those of the white settlers, and like them surrounded with enclosed fields of corn, cotton, sweet potatoes, &c., with cribs, sheds, droves of swine, flocks of geese, and all the usual accompaniments of a thriving settlement.

Graves, our landlord, though unable to speak or understand our language, held some communications with us by means of signs, occasionally assisted by a black girl, one of his slaves, who interpreted the Cherokee language. He told us, among other things, that the Osages do not know how to fight; that the Cherokees were now ready to give up the Osage prisoners, if the Osages would deliver into their hands the individuals who had formerly killed some of the Cherokees, &c. He has shown his admiration of military prowess, by calling one of his children Andrew Jackson Graves. He treated us with a good degree of attention, and showed himself well acquainted with the manner of making amends by extravagant charges. Our dinner was brought in by black slaves, and consisted of a large boiled buffaloe fish, a cup of coffee, corn bread, [129] milk, &c. Our host and his wife, of unmixed aboriginal race, were at table with us, and several slaves of African descent were in waiting. The Cherokees are said to treat their slaves with much lenity. The part of the nation now residing on the Arkansa, have recently removed from a part of the state of Tennessee. They

are almost exclusively agriculturists, raising large crops of corn and cotton, enough for clothing their families, which they manufacture in their own houses.

After dinner we proceeded a few miles, taking with us one of Graves's sons as a guide, who led us to a place affording good pasture for our horses. Here we encamped.

September 24th. From the settlement of the Cherokees, at Rocky Bayou, our route lay towards the southeast, across the succession of rocky hills, sparingly wooded with oak, intermixed with the cornus porida, attaining an unusual magnitude.

As we descended towards the Arkansa, we perceived before us the cabins and plantations of another settlement of Cherokees. Passing near a wretched and neglected tenement, we observed a white man, who appeared to be the occupant, and called upon him to direct us to the place where, as we had been told, the river could be forded. It was not until we had repeated our request several times, that he seemed disposed to give any attention. He then approached at a snail's pace, and setting himself down upon the ground, drawled out his direction, terminating each word with a long and hearty yawn. The depression and misery which seemed written on his features, and the sallowness of his complexion, convinced us that disease, as well as native indolence, had some share in occasioning the apparent insolence he had shewn, and cured us of any wish we might have felt to reproach him.

Following a winding pathway, which led through deep-tangled thickets and heavy cane-brakes, we [130] arrived at the ford, and crossing without difficulty, halted at the settlement of Walter Webber,[10] a young chief of the Chero-

[10] Webber lived near the mouth of Illinois Creek, in Pope County.— Ed.

kees. Here we found the gentlemen of our party who had left the garrison before us.

The chiefs of the Cherokee nation had called a grand council, to meet at Point Pleasant the day after our arrival there, to adopt measures to forward the negociations for peace with the Osages, with whom they had been at variance for many years. The origin of the quarrel, existing between these powerful and warlike nations, is by some referred to the period of the American revolution, when the Osages killed a number of refugees, who had fled to them for protection. Among these were some Cherokees, some Indians of mixed breed, and it is said some Englishmen, to whom the success of the American arms rendered unsafe a longer residence in the country then occupied by the Cherokee nation. Whether the outrage thus alleged against the Osages was in fact committed, it is not at this time easy to determine. It appears, however, agreeably to the information we have been able to collect, that of late years the Cherokees have almost uniformly been the aggressors, while the abuses of the Osages, so loudly complained of, both by the Cherokees and the Whites, have been acts of retaliation. A large number of Cherokees now live on the south side of the Arkansa, upon lands claimed by the Osages; and all the Cherokees of the Arkansa are in the habit of hunting and committing depredations upon the Osage hunting grounds. In 1817, the Cherokees, with a number of Delawares, Shawnees,[11] Quapaws, and eleven American volunteers, the whole amounting to about six hundred men, made an irruption into the territory of the Osages, having pre-

[11] For the Delaware Indians, see Post's *Journals* in volume i of our series, note 57; for the Shawnee, Weiser's *Journal*, *ibid.*, note 13.— Ed.

viously taken measures to quiet the suspicions of their enemies, by occasional messages, professing a peaceable disposition on their part. When they had arrived near the village, they [131] sent a deputation to the Osages, concealing at the same time their numbers and their hostile intention, and inviting Clermont, the chief, to a council which they proposed to hold at a little distance from the town. Clermont being absent on a hunt with the young men of his village, an old Indian, and one in high standing with his people, was appointed to act in his stead, and commissioned to conclude a peace with the Cherokees, according to the wish they had expressed by their messengers. But what was his surprise, when, on arriving at the spot designated as that at which the council was to be held, instead of a few chiefs and old men, as had been represented, he found himself surrounded by the whole armed force of the Cherokees. He was seized and put to death on the spot. The design of this act of perfidy had been to effect the destruction of Clermont, the bravest and most powerful of the Osages. The Cherokees then proceeded to the attack of the town, where, on account of the absence of the efficient men, they encountered little resistance. A scene of outrage and bloodshed ensued, in which the eleven Americans are said to have acted a conspicuous and a shameful part. They fired the village, destroyed the corn and other provisions, of which the Osages had raised a plentiful crop, killed and took prisoners between fifty and sixty persons, all old men, women, and children. Four of these prisoners, who had been since held in captivity by the Cherokees east of the Mississippi, had been brought to Point Pleasant, by a metiff called Captain Rogers, and a consultation was now

to be held, concerning the manner of restoring them to the Osages.

In the winter of 1817-18, some of the leading men of both nations had been summoned to a council at St. Louis, by Governor Clark, for the purpose of negociating a peace. By the treaty then made, the Cherokees had agreed to relinquish the prisoners in question, in consideration of which they were to be [132] allowed the privilege of hunting in the country north of the Arkansa, as high as the Grand river or Six Bulls, and on the south side as high as they pleased.[12] The stipulated surrender of the prisoners not having been made, a party of Osages, who were hunting on Red river, some time in the ensuing winter, fell in with three Cherokee hunters, and whom they murdered by way of retaliation. This circumstance tended to widen the breach between them, till at length both parties were resolved on war, which was for the present prevented by the interference of Governor Miller, and by the check imposed by the presence of an armed force at Belle Point, on the frontiers of the two nations. At the time of our visit, it was hoped the influence of Governor Miller would effect the establishment of a permanent peace. The first of the ensuing month (October) had been appointed for the surrender of the prisoners, and Governor Miller was said to be then on his way to Belle Point, to ensure the fulfilment of the conditions stipulated between the contending parties. The Osages were to give up the men concerned in the

[12] This treaty was dated October 6, 1818. Article 3, which grants the hunting privileges, reads as follows: "The Osages do hereby grant to the Cherokees and their allies an undisturbed passage to the hunting country, with permission to occupy and hunt on all the lands which they claim south of the Arkansas river." See *American State Papers*, "Indian Affairs," ii, p. 172.— Ed.

murder on Red river, in exchange for the women and children then prisoners with the Cherokees.

The Cherokees were taught the culture of cotton many years since, by Governor Blount[13] of North Carolina, who offered them a stipulated price per pound, for all they would deliver at the trading-house. They were for several years paid regularly for their cotton; but the factor at length refusing any longer to receive it, they complained to Governor Blount, who advised them to manufacture it into clothing for their own use, which they consented to do, on condition of being furnished with a person to give the requisite instruction. They now raise considerable quantities of cotton, and many of them are comfortably clad in garments of their own manufacture.

The introduction of a considerable degree of civilization among the Cherokees, has been attended [133] with the usual consequence of inequality in the distribution of property, and a larger share of the evils resulting from that inequality, than are known among untutored savages. Encroachments upon the newly-established rights of exclusive possession have been frequent, and have rendered the numerous class of the poor among the Cherokees troublesome neighbours, both to the wealthy of their own nation, and to those of the white settlers in their vicinity who had any thing to lose. But wealth seldom finds itself destitute of the means of protection. Three bands of regulators, or troops of light horse, as they are sometimes called, are maintained among the Cherokees, consisting each of ten men well armed and mounted, and

[13] For sketch of William Blount, see André Michaux's *Travels*, in our volume iii, note 95.— Ed.

invested with an almost unlimited authority.[14] A few days previous to our arrival at Point Pleasant, a young man had been apprehended by one of these bands of regulators, on suspicion of horse-theft. On examination, the supposed delinquent proved stubborn and refractory, whereupon the captain ordered the infliction of fifty lashes; and this not seeming to produce the desired effect, an additional fifty was commenced, when the culprit confessed himself guilty, and disclosed the whole transaction, in which he had been concerned. We were called upon for advice in the case of the Osage prisoners, a young woman and three children labouring under an attack of intermitting fever. The young woman we found sitting upon the floor in a little cabin, near the trading-house, and crying bitterly, not more, as we were informed, on account of ill-health, than of her reluctance to return to the Osages. She had been long among the Cherokees, whose customs she had adopted, and among whom she had formed attachments.

Tikatok's village, which we passed on the 25th, is situated on the Illinois Bayou,[15] about seven miles above

[14] Mr. John Rogers, a very respectable and civilized Cherokee, told me that one of the regulators happening to have a relation who had been repeatedly guilty of theft, and finding him incorrigible, he destroyed his eyesight with a penknife; saying, "As long as you can see you will steal; I will, therefore, prevent your thefts by the destruction of your sight." Nuttall's Travels into the Arkansa Territory, p. 135.. to which work the reader is referred for an interesting sketch of the history, and of the present condition of the Cherokees. We think it unnecessary to dwell longer upon a subject which has been so frequently discussed. — JAMES.

Comment by Ed. See reprint in our volume xiii, p. 190.

[15] Illinois Bayou is a large creek draining Pope County, on the north side of the river. Near the Indian village, Dwight Mission was established in 1820 (see Nuttall's *Journal*, in our volume xiii, note 148). By inference, Point Pleasant was at the creek's mouth.— ED.

Point Pleasant. It consists of no more than [134] five or six cabins, but is the residence of the venerable Tikatok, who, since the death of Tallantusky in 1817, has been considered the principal chief of this portion of the Cherokee nation. He has been a distinguished benefactor to his people, and is familiarly known by the name of "The Beloved." The Cherokees who live at and about this village, and those settled at a distance from the Arkansa, generally are less subject to fevers than those who reside on the river bottoms. At a little distance above the village we left the Illinois, and proceeded across the wilderness towards Little Red river, on our route to Cape Girardeau. Two or three scattered plantations, occupied by Cherokees, occur in the country between Point Pleasant and Little Red river, where we arrived on the 28th. This river has a deep rocky channel, sixty or one hundred yards in width, at the point where we crossed it, which is distant about eighty miles from its confluence with White river. It had at this time scarcely a perceptible current, and in many places might be crossed on foot without wading. It is, however, like most of the rivers of this region, subject to great and sudden floods, which, in several instances, have drowned the cattle, and destroyed and swept away the crops of those who were settled along the banks. From the marks left by the last flood upon the banks, we perceived that the range, from high to low water, could not be less than sixty feet. From Stanley's settlement on Little Red river, it is about thirty-six miles north-east to Harding's ferry on White river. Here are numerous settlements of Whites; but notwithstanding the country is hilly and profusely irrigated with numerous rapid streams, the inhabitants have almost without exception

a sickly appearance. Harding's ferry is about four hundred miles distant from the confluence of White river and the Mississippi.[16] White river is navigable for keel-boats at high water to this place, and during a considerable portion of the year, they [135] may ascend one hundred miles farther. It is here about three hundred yards wide. Its water is remarkably clear, and flows with a moderate current over a gravelly or stony-bed.

Near Harding's ferry, on the south side of White river, is the Chattahoochee mountain,[17] of about two thousand feet elevation, somewhat surpassing any other point in its vicinity. The top of this mountain marks the north-eastern angle of the Cherokee boundary, as established by General Jackson's treaty. The eastern boundary of the tract, ceded by that treaty to the Cherokees, runs in a straight line from the top of the Chattahoochee to the mouth of Point Remove or Eddy Point creek, which enters the Arkansa about thirty miles above Cadron. This line coincides nearly with the eastern limit of the

[16] The waters of Little Red River are gathered from creeks heading in Van Buren, Searcy, and Stone counties. The main stream traverses Cleburne and White counties; it is navigable by small boats for about fifty miles. The route of the party from Illinois Creek to White River lay through the present counties of Pope, Van Buren, the northwest corner of Cleburne, and the adjoining portion of Stone; they probably crossed Little Red River near Clinton, seat of Van Buren County. The permanent occupation of this region by whites dates from the removal of the Cherokee (1825), and little record remains of earlier settlements.

Harding's (Harden's) Ferry was near the present Stone-Independence county boundary; the proprietor's house stood on the right bank of the river, ten miles above Batesville, seat of Independence County.— ED.

[17] The treaty specified Shield's Ferry, on White River, as the locus of the northeastern corner of the Cherokee reservation. A bold headland on the south side of the river, five miles above Batesville, still known as Shield's Bluff, is pointed out by residents as the point where the Cherokee line began. This bluff rises about six hundred feet above the river.— ED.

mountainous region. Many small portions of valuable land are included in the territory lately ceded to the Cherokees, but by far the greater part is mountainous and barren, and unfit for cultivation. White river has its source in the Ozark mountains, near the 94th degree of west longitude, and about the 36th degree north latitude, in the same district, from which descend, on the southwest the Illinois river of Arkansa, and on the north the Yungar Fork of the Osage. The average direction of its course is nearly due east parallel to the Arkansa, crossing about four degrees of longitude to its confluence with Black river, in latitude 35° 15′, then turning abruptly south, it flows through 1° 15′ of latitude to its bifurcation, and the confluence of its eastern branch with the Mississippi in 34 degrees north.[18] Below the point where it receives the Black river from the north, and even at the Chattahoochee mountains, near one hundred miles above that point, White river is little inferior, either in the width of its channel, or in its volume of water, to the Arkansa under the same meridian. When we have had occasion to mention among the people of White river, that we [136] had crossed the Arkansa at the Rocky Mountains, more than one thousand miles to the west, the question has been repeatedly put to us, "Where did you cross White river?" Those who have known only the lower portions of both

[18] The geographical position of the sources of White River is accurately given in the text, but the statement is surprising, that "the average direction of its course is nearly due east parallel to the Arkansas." From its origins in Washington and Madison counties, in northwestern Arkansas, the river flows north, entering Barry County, Missouri, and traversing Stone and Taney counties before leaving that state. In Arkansas, its direction is southeast to the confluence with the Black, and thence almost south to the Mississippi.

The sources of Black River are in Reynolds and Iron counties, Missouri; its course is nearly south.— Ed.

rivers, consider them as nearly of equal length, and as heading near each other; whereas the entire extent of country drained by White river, compared to that of the Arkansa, is as one to six nearly. Three miles above its confluence with the Mississippi, White river divides into two branches, the lesser of which, turning off at right angles, flows south-west, with a current sometimes equal to three miles per hour, and falls into the Arkansa at the distance of four miles and a half. It is said the current flows through this communication alternately to and from the Arkansa, according as the water in that river is higher or lower than in White river. Major Long entered the Arkansa through this cut-off on the 13th of October 1817, and it has been passed more recently by Mr. Nuttall,[19] in 1819. In both these instances the current flowed from White river towards the Arkansa. The mouth of that branch of White river which communicates immediately with the Mississippi is situated fifteen miles above the mouth of the Arkansa,[20] and is about two hundred yards wide. The current is very gentle, and the water deep. Though perfectly transparent, it is of a yellowish colour. The banks are low, and subject to periodical inundations. The soil near the mouth of White river is an intermixture of clay and fine sand, the clay predominating, and the whole of a reddish tinge.

[19] Nuttall's Travels, p. 65.— JAMES.

Comment by Ed. Page 98 of our reprint.

[20] The confluence of White river with the Mississippi, has been said to be "situated fifty miles above the mouth of the Arkansa." It has also been asserted, that its bifurcation is at "about thirty miles above its junction with the Mississippi." See *Schoolcraft's* View of the Lead Mines of Missouri, p. 248. 253. There is, however, little reason to fear, that errors of this sort, upon a subject so familiarly known, will obtain general currency. In the same work, the length of White river is said to be thirteen hundred miles.— JAMES.

Numerous settlements have heretofore been formed on the lands contiguous to White river, and several in the portion above the Chattahoochee mountain on the south side; but all these lands having by treaty been surrendered to the Cherokees, many whites [137] have been compelled to withdraw, and leave their farms to the Indians. The tract of land ceded to the Indians by the treaty above alluded to, is for the most part rocky and barren. Some of the tributaries of White river have extensive and fertile bottoms, but the greater part of the country watered by this river, is mountainous and unfit for cultivation. At MacNeil's ferry, where the road from Little Rock on the Arkansa to Davidsonville, in Lawrence county, crosses White river, the bottoms are wide, and as fertile as any of those on the Arkansa.[21] Here the miegia and the papaw attain their greatest perfection, and the soil is found well adapted to the culture of corn, cotton, and tobacco. At the point formed by the confluence of White and Black rivers, is a portion of land of a triangular form, and bounded by sides about fifteen miles in extent, which, in the excellence of its soil, as we were informed by the surveyors, is surpassed by none in the western country. There are considerable portions of the upland soil of White river, where the profuse supply of streams and springs of excellent water, the elevation and com-

[21] This road crossed White River a few miles, perhaps ten, below Batesville. The St. Louis and Iron Mountain Railroad follows the line of the old road, although somewhat to the eastward.

The site of Davidsonville was chosen in the autumn of 1815; it was at the mouth of Spring River (see *post*, note 26). The town was seat of Lawrence County until 1829; but after the removal of the court to a rival village, it declined and became extinct.— Ed.

parative healthfulness of many situations, and the vicinity of navigable rivers and other local advantages, make amends for the want of exuberant fertility in the soil. The same remark is applicable to the country south of the Arkansa, where are extensive tracts of hilly and rocky soils, which seem admirably adapted to the culture of the vine and the olive. In every part of the Ozark mountains, there are vallies, and small portions of land within the hills, having a deep and fertile soil, covered with heavy forests of oak, ash, hickory, and in some places with the sugar maple, and abounding in excellent water. The labour of a few years will be sufficient to convert these tracts into productive farms, but the inconvenience resulting from the difficulty of communication and access to the different [138] parts of the country, will for a long time retard their settlement.

In several parts of the Arkansa territory we were shewn dollars, which were believed to have been coined in some of the upper settlements of White river; and it has been currently reported, that mines of silver exist, and are wrought there. It appears, however, upon examination, that much spurious coin is here in circulation; and it is probable that the White river country owes its present reputation for mineral wealth to the successful labours of some manufacturer of imitation dollars. Since the time of De Soto, it has been confidently asserted by many who have written concerning Louisiana, that mines of gold and silver exist in that part of the country of which we are speaking. In an old map, by Du Pratz, a gold mine is placed somewhere near the confluence of the Illinois and the Arkansa; a silver mine on the Merameg, and he says,

"I myself saw a rivulet whose waters rolled down gold dust."[22] We are informed by Schoolcraft, that granite exists about the sources of the St. Francis, which are near those of White river.[23] Of the extent and character of this formation of granite, we have not yet been able to form any very definite ideas; it is, however, by no means improbable, that to its plates of yellow and white mica, we are to look for the origin of the fabulous accounts of the precious metals in those regions. Like the country of the gilded king, the El Dorado of South America, it is probable the gold and silver mines of the Arkansa territory will recede, before the progress of examination, first into the wildest and most inaccessible parts, and at length disappear entirely. We by no means intend to assert, that the region in question will not prove of immense importance, on account of its mineral treasures; valuable mines of lead and iron are certainly frequent in many parts of it. And we can assign no reason why silver [139] and other metals should not be found in the argillite with quartzy veins, and in the other rocks of the transition

[22] The mine of Merameg, which is silver, is pretty near the confluence of the river which gives it name, which is a great advantage to those who would work it, because they might easily, by that means, have their goods from Europe. It is situate about 500 leagues from the sea. *Du Pratz'* Louisiana, vol. i, p. 294.— JAMES.

Comment by Ed. The reference is to volume i of the London edition of 1763; the quotation in the text is from *ibid.*, pp. 362, 363.

[23] P. 213.— JAMES.

Comment by Ed. Granite from quarries in Iron County, Missouri, was used in the construction of the capitol at Springfield, Illinois, of the custom houses at St. Louis and Cincinnati, and of other important works.

St. Francis River rises in St. François County, Missouri, a few miles east of the sources of Black River. The mention of White River in the text is a slip of the pen. The whole course of the St. Francis is parallel to that of Black River and lower White River. It falls into the Mississippi at the northeast corner of Phillips County, Arkansas.

period, which we know to exist in these mountains. We only intend to give it as our opinion, that there has as yet been no foundation in actual discovery for the belief that such mines do exist.

The bed of White river, at the place where we crossed it, is paved with pebbles and fragments of a yellowish white petrosiliceous stone, intermixed with rounded masses of transparent quartz, and sometimes with pieces of calcedony. Its water is uncommonly transparent, and this, with the whiteness of its bed, and the brisk motion of the current, gives it an aspect of unusual beauty. The banks are high, and in many places not exposed to inundation. Dense and heavy forests of sycamore and cotton-wood stretch along the river, disclosing here and there, at distant intervals, the solitary hut and the circumscribed *clearing* of the recent settler. Some who have been no more than two or three years resident upon their present farms, and who commenced in the unbroken forests, have now abundant crops of corn and pumpkins, with large fields of cotton, which is said to equal in quality that of the uplands of Georgia and Carolina. Few attempts have hitherto been made to cultivate any grain, except Indian corn, though the soil is thought to be in many places well adapted to wheat, barley, oats, &c. The maize cultivated in the Arkansa territory, and in the southern and western states, generally is the variety called the ground seed, having a long and compressed kernel, shrivelled at the end when fully ripe; and crops are not uncommon yielding from sixty to ninety bushels per acre. In all the uplands, the prevailing growth is oak. At the time of our journey, the acorns were falling in such quantities, that the ground for an extent of many

acres was often seen almost covered with them. Many recent settlers, indulging the disposition to indolence which seizes upon almost every man who [140] fixes his residence in these remote forests, place as much dependence upon the crop of mast as on the products of their own industry. Vast numbers of swine are suffered to range at large in the forests, and in the fall of the year, when they have become fat by feeding on the acorns, they are hunted and killed like wild animals, affording to the inhabitants a very important article of subsistence. It is remarked also, that the venison becomes fat somewhat in proportion as acorns are abundant. Turkies, which are still vastly numerous in the settlements of White river, feed upon them, but are said to grow poor in consequence.

Sweet potatoes[24] are produced in great perfection in many parts of the Arkansa territory, and are but too much cultivated and eaten, their constant use as an article of food being little beneficial to health. The common or *Irish potatoe*, as it is here universally called, succeeds but indifferently, and few attempts are made to cultivate it.

A few of the roads which traverse the country from the Mississippi to the upper settlements of Red river and the Arkansa, have been sufficiently opened to admit the passage of waggons. On these are seen many families migrating from Missouri to Red river, and from Red river to Missouri. The first settlements in the wilderness are most commonly made by persons to whom hardihood and adventure have become confirmed and almost indispensable habits, and who choose to depend upon the chase, and the spontaneous products of the unreclaimed

[24] The tuberous roots of the convolvulus batatas of Linnæus. — JAMES.

forest, rather than submit to the confinement and monotony of an agricultural life. They are therefore, of necessity, kept somewhat in advance of those settlers who intend a permanent residence in the situations they first occupy. Removing from place to place with their cattle, horses, and swine, they confine themselves [141] to one spot no longer than *the range* continues to afford a sufficient supply of the articles most necessary to life. When the canes are fed down and destroyed, and the acorns become scarce, the small corn-field and the rude cabin are abandoned, and the *squatter* goes in search of a place where all the original wealth of the forest is yet undiminished. Here he again builds his hut, removes the trees from a few acres of land, which supplies its annual crop of corn, while the neighbouring woods, for an extent of several miles, are used both as pasture and hunting grounds. Though there is in this way of life an evident tendency to bring men back to a state of barbarism, we have often met among the rudest of the squatters with much hospitality and kindness. Near White river, we called at a house to purchase food for ourselves and our horses, but having no silver money, our request was refused, although we offered the notes of the bank of Missouri, then in good credit. In a few miles we arrived at another cabin, where we found every member of the numerous family sick with the ague and fever, except one young girl. But here they were willing to furnish every refreshment their house afforded. There were at this time very few houses, particularly in the settlements about White river, which did not exhibit scenes of suffering similar to those in the one of which we were now the reluctant guests. We have seen some

instances, where, of a family of eight or ten, not a single individual was capable of attending to the services of the household, or of administering to the wants of his suffering relatives. In these instances we thought it better to pitch our tents at a little distance, and intrude ourselves no farther than was necessary to procure corn and other indispensable supplies.

On the evening of September 30th, we halted at a little rivulet called Bayou Curæ.[25] The dwelling of our landlord consisted, as is commonly the case in the new settlements, of a single room, with beds in [142] two or three of the corners. We were cordially invited to make use of the beds, though it would have been at the expence of rendering it necessary for our host, his wife, and daughters, to sleep upon the floor of the same room. We accordingly spread our blankets, and deposited ourselves around the hearth, while the family occupied their usual stations. On the first of October we arrived at the ford of Strawberry river, a tributary entering the Big Black, not far from the confluence of the latter with White river, and about fourteen miles beyond, at the ford of Spring river, a parallel stream. Both of these are rapid and beautiful rivers, possessing all the peculiarities, as to the abundance, transparency, and purity of their waters, usually observed in those rivers which traverse elevated and mountainous districts. The entire length of Spring river is said to be but about one hundred and forty miles; yet in the quantity of water which it discharges, it more than twice exceeds the Canadian, having a course of more than nine hundred miles. It is said to have its principal source in a spring

[25] Now Cura Creek, which falls into the Black from the west, in northeastern Independence County.— Ed.

of uncommon magnitude. Spring river unites with another, called Eleven Point, near the little town of Davidsonville, the seat of justice for Lawrence county, and flows thence nearly due east, two or three miles to its junction with Big Black. The country around Davidsonville is hilly, having a deep and fertile primary soil, and abounding in heavy forests. The sources of Eleven Point, we have been told, are in eleven large springs, and are near those of Spring river.[26]

To those who have been long accustomed to the thirsty regions of the Missouri, the Platte, and the Upper Arkansa, it is somewhat surprising to meet in tracts, having nearly the same elevation, and resting to a great extent on rocks of a similar character, so great a number of large streams crowded into such narrow compass.

[143] Is it not probable, that a large portion of the water falling in rains upon the extensive plains at the eastern side of the Rocky Mountains, may sink through the loose and porous soil, till at length, meeting with some compact stratum, it may be collected into rills, and even considerable streams, which, descending along the surface of this

[26] Strawberry River is a considerable stream, which unites with Black River on the southern line of Lawrence County. It flows from Izard County across Sharp, and the southwest portion of Lawrence. Some of the earliest settlers in this region occupied its fertile bottom lands as early as 1810-12.

The chief source of Spring River is known as the Mammoth Spring of Fulton County; it is near the Missouri boundary, in the northeastern corner of the county. The water issues from an opening a hundred and twenty feet in circumference, at the rate of nine thousand barrels per minute. An apparent boiling is produced by gas in solution. Myatt's Creek and South Fork, branches of Spring River which are longer but convey less water, rise beyond the state line, traverse Fulton County in a southeasterly direction, and join the main stream near the Sharp County line. Thence the course is southeast across Sharp County, and along the Randolph-Lawrence county boundary to Black River.

Eleven Point River rises in Howell County, Missouri, crosses Oregon County, and thence flows south through Randolph County, Arkansas.— ED.

stratum in the direction of the general inclination of the country, at length meet with the nucleus of the Ozark mountains, traversing the secondary strata like a mineral dike, and are consequently made to appear in the form of large springs? Whether any course of this kind operates to supply the unusual profusion of water with which this hilly tract is irrigated, must be for others to decide. The fact is an established one.

Black river originates in an elevated part of the Ozark mountains, between 37° and 38° north latitude, and between 90° and 91° west longitude. From the same tract descend, on the north, the waters of the Merameg; on the north-east, those of Big river;[27] on the east and south, those of the St. Francis and Black river; and on the west, those of the Osage and the Gasconade. By an examination of the map which accompanies this work, it will be seen that the direction of the watercourses clearly indicates the existence of an elevated ridge, running from the confluence of the Missouri and Mississippi, on the north-east, to the junction of the Arkansa and the Canadian on the south-west. On the north-western side of this ridge, we observed the Osage, the Grand river, the Verdigrise, and even the Arkansa, inflected from that due eastern course, which the tributaries of the Mississippi and Missouri on the west incline to pursue; and coming near its base, we find the Illinois river of the Arkansa, and the Yungar Fork of Osage, running in opposite directions, and nearly at right angles to the general course of the Canadian, the Arkansa, the Main Osage, and Konzas.

[27] Big River originates in Iron County, Missouri, near the sources of Black River; it pursues a devious course, traversing Washington, St. François, and Jefferson counties, and falls into the Meramec about thirty miles above the confluence of the latter with the Mississippi.— ED.

The Illinois, and the great eastern tributary of the Osage, [144] receive numerous streams from the western slope of the Ozark mountains, but they traverse a region hitherto very imperfectly known. It appears, however, that these two rivers drain all the north-western side of the mountainous range in question. Black river runs nearly parallel, that is, from north-east to south-west, along the south-eastern side of the range. Its sources are in the district of the lead mines, and at no great distance from those of the Merameg and the St. Francis. Its course is at first south-east, about sixty or one hundred miles; then turning to the south-west, it receives in succession from the south-eastern side of the mountains, the Little Black, the Currents, Fourche De Thomas, Eleven Point Spring, and Strawberry rivers, uniting at length with White river, in latitude 35° 15′. As far as hitherto known it receives no considerable tributary from the east.[28] About the sources of Black river reside the Peola or Peoria Indians, who are said to number about fifty warriors. Parallel to this river, and from twenty to sixty miles distant on the east, is the St. Francis, a larger

[28] Little Black River heads in Carter County, Missouri; it is a tributary of the Currents, although the combined stream is sometimes called Little Black.

Currents (Current) River rises in Texas County, Missouri, and flows first northeast then southeast, traversing Shannon, Carter, and Ripley counties, in that state, and portions of Clay and Randolph counties in Arkansas. It joins Little Black in Clay. Currents River rivals Black River itself in size.

There are many variants of the name of the stream here called Fourche De Thomas. The Philadelphia edition has Thomas' river or fork; elsewhere it is given indifferently as Fourche à Thomas, Fourche à Dumas, and Fourche Dumas, while a recent map has Fouche or Dumaz. It heads in Ripley County, Missouri, and flows south. Pocahontas, seat of Randolph County, Arkansas, is just below its mouth.

In addition to those mentioned, Black River receives a few small western tributaries above the Missouri line — among them, Cane Creek in Butler County, and Logan's Creek in Reynolds County.— Ed.

river, but one in many respects resembling Black river. It rises in the high lands, about one hundred miles to the westward of St. Genevieve in Missouri, and receiving, before it leaves the hills, Bear Creek, Castor, White water, and numerous other streams, it descends toward the south-east, soon entering the extensive swamp which stretches from New Madrid on the Mississippi, along the base of the mountains, to the Arkansa.[29] We have been informed by some of the inhabitants of the counties of Cape Girardeau and Madison, that in this swamp the St. Francis is so much obstructed with rafts, and so lost among islands, that its course can with difficulty be traced. It is well known that in the lower part of its course it is so obstructed by a large raft, as not to admit the passage of the smallest boats. Its confluence with the Mississippi is about three hundred and five miles below the Ohio, and eighty above the mouth of White [145] river. Running parallel both to the Mississippi and White river, and at no great distance from either, the St. Francis can have no very large tributaries; indeed we know of none on either side which deserve the name of rivers. We have no very definite information respecting the great swamp in which the St. Francis is said to lose itself soon after leaving the hills; the accounts of the hunters, and of some settlers who have seen it, agree in representing it as almost im-

[29] Dr. James did not possess accurate information relative to these water-courses. Bear Creek is a Wayne County, Missouri, branch of Castor River. The latter rises in St. François County and loses itself in the swamp near the state line. Whitewater rises near Castor, but flows as far east as Cape Girardeau County, below which it is known as Little River. It also enters the swamp; the St. Francis receives the overflow from the swamp district, where the waters of many streams mingle. The New Madrid earthquake caused a general subsidence of the surface in this region, and altered the courses of many waterways.— Ed.

passable, covered with heavy forests of cypress, and wholly unfit to become the residence of men. This swamp, and the country about the sources of Black river and the St. Francis, appear to be near the centre of the region so powerfully affected by earthquakes in the year 1811. The fertile lands, on the upper branches of the St. Francis, are not very extensive, and are all more or less subject to inundation by the sudden overflowing of the streams. On this account they cannot be considered as of great value for agriculture; but the wealth which this region possesses in its mines, renders it one of the most important parts of ancient Louisiana.

On the 8th October we arrived at Jackson, the seat of justice for the county of Cape Girardeau, and, after St. Louis and St. Charles, one of the largest towns in Missouri.[30] It lies about eleven or twelve miles north-west of the old town of Cape Girardeau, on the Mississippi, and is surrounded by a hilly and fertile tract of country, at this time rapidly increasing in wealth and population. Jackson is what is called a thriving village, and contains at present more than fifty houses, which, though built of logs, seem to aspire to a degree of importance unknown to the humble dwellings of the scattered and solitary settlers, assuming an appearance of consequence and superiority similar to that we immediately distinguished in the appearance and manners of the people. Our horses, having never been accustomed to such displays of magnificence, signified great reluctance to enter the [146]

[30] Jackson was laid out in 1815. Its selection as county seat was a severe blow to the older town of Cape Girardeau; but the growth of river trade, after steamboat navigation became regular, restored the latter's ascendency. The population of Jackson in 1818 was about three hundred; at present it numbers a thousand.— Ed.

village. Whips and heels were exercised with unusual animation, but in a great measure without effect, until we dismounted; when by dint of coaxing, pushing, kicking, and whipping, we at length urged our clownish animals up to the door of the inn.

Fifteen miles north of Jackson, on a little stream called Apple creek, reside about four hundred Indians, mostly Delawares and Shawnees. At the time of our visit the head of a Shawnee, who had been concerned in the murder of a white woman, was to be seen elevated on a pole by the side of the road leading from Jackson to the Indian settlement of Apple creek. It was related to us that the crime, for which this punishment had been inflicted, was committed at the instigation of a white man. The murderer was demanded of the Shawnees by the people of Jackson, and being at length discovered by the Indians, and refusing to surrender himself, he was shot by his own people, and his head delivered up, agreeable to the demand.

It is painful to witness the degradation and misery of this people, once powerful and independent; still more so to see them submitting to the unnecessary cruelties of their oppressors. We have not been informed by what authority the punishment above mentioned was inflicted upon a whole community for the crime of one of its members, and we are sorry to have occasion to record a circumstance so little honourable to the people of Missouri.

A miserable remnant of the Shawnee, Delaware, and Peola tribes, with a few Chickasaws and Cherokees, were at this time scattered through the country, from the Mississippi at the mouth of Apple creek westward to the sources of Black river. They were, however, about to remove farther west, and many of them were already

on their way to the country about the upper branches of White river, where, by becoming intruders upon the territories of the Cherokees, it may be expected their speedy and entire extinction will be insured.[31]

[147] The road from White river joins that from the upper settlements on the St. Francis, at some distance beyond Jackson. Castor and White water are two beautiful streams, traversing the country west of Jackson. They run towards the south, and soon after their confluence enter the great swamp through which they find their way to the St. Francis.

The district of the lead mines, situated near the sources of the Merameg, the Gasconade, and the St. Francis, has been repeatedly described. The best accounts of it are in the works of Bradbury, Brackenridge, Stoddart, and Schoolcraft.[32] To those accounts we have to add a few observations respecting the rocks and soils of the region, a considerable part of which we have seen and examined as attentively as circumstances would admit. But as discussions of this kind have little interest for the general reader, we propose to give at the end of the work such remarks as we have had the opportunity to make connected with the mineralogy of this interesting territory.

[31] The Peoria Indians were an Algonquian tribe of the Illinois family. The French explorers found them on the Illinois River, in the vicinity of the present city of Peoria; but early in the eighteenth century, hard pressed in war, they joined the kindred Cahokia and Kaskaskia near the villages of the same names. The remnant of the tribe, numbering about two hundred, is established on the Quapaw Reservation in Indian Territory.— ED.

[32] Bradbury's Travels in the Interior of America, p. 258, 2d edition [our volume v, p. 248]. Brackenridge's Views of Louisiana, p. 390. Stoddart's Sketches of Louisiana, p. 390.— JAMES.

[148] CHAPTER II [X][33]

Hot Springs of the Washita — Granite of the Cove — Saline River

We return to give a hasty account of an excursion from Point Pleasant, in the country of the Cherokees, to the hot springs of the Washita.

On the morning of the 25th, our little party, consisting of Captain Kearney, Lieutenant Swift, and myself, having taken leave of our companions, recrossed the Arkansa from Webber's, and proceeded on our journey without a guide.

Having mistaken the route we had been directed to follow, we were bewildered during a considerable part of the day, wandering about through a fertile country without settlements, and so covered with dense forests as to render the travelling exceedingly harassing. Towards evening we arrived at a settlement of Cherokees, where we engaged a guide to conduct us to the trace leading to the springs. For this service we paid him two dollars. At night we encamped in an open forest of oak, where we found a sufficient supply of grass for our horses. The hills south of the Arkansa range from N. E. to S. W., their sides are sometimes nearly naked, but more commonly covered with small and scattered trees. Several kinds of oak, and the chinquapin (castanea pumila, Ph.) attaining the dimensions of a tree, are met with in the sandstone tracts. We distinguished here, in the uplands, two separate varieties of soil. That just mentioned,

[33] For the following topics mentioned in this chapter, see Nuttall's *Journal*, in our volume xiii: Derdonai (note 146), Hot Springs (135), Hunter and Dunbar (211), Petit Jean River (140), Le Fevre (119, 132), Poteau River (169), roads in Arkansas (126), Kiamichi River (177), Saline of Ouachita (125).— Ed.

based upon a compact hard sandstone, and bearing forests of oak, and another resting upon a white petrosiliceous rock, with fragments of which it is much intermixed. This latter is often covered [149] with pine forests. The most common species, yellow pine (P. resinosa,) attains unusual magnitude. The rigida, and some other species occur, but are not frequent. We also observed several species of vaucinum, the mitchella, the kalmia latifolia, hamamelis virginica? cunila mariana, and many other plants common to this region and the Alleghany mountains.

There are no settlements between those of the Cherokees about Derdonai on the Arkansa and the hot springs. The blind path which we followed traverses a rugged and mountainous region, having considerable resemblance, except in the want of parallelism in the ranges, to the sandstone portions of the Alleghanies. As the weather was rainy we felt the inconvenience of travelling in the wilderness and encamping without tents. On the 28th we arrived at the hot springs. The country near these, on the north and north-west, is high and rocky. The sandstone, which extends from the Arkansa to within a few miles to the springs, becomes, as you go south, something inclined, and apparently of a more ancient deposition, until it is succeeded by a highly inclined primitive argillite. Both these rocks are traversed by large veins of white quartz. They are inclined towards the south, and the argillite at a great angle. In some localities it is but indistinctly slaty in its structure, and its laminæ are nearly perpendicular.

It contains extensive beds of a yellowish white siliceous stone, which is often somewhat translucent, and resembles

some varieties of hornstone. Its fracture is a little splintery, and sometimes largely conchoidal; it is of a close texture, but the recent surface is generally destitute of lustre. It is this rock which affords the stones called Washita oil-stones. It may, with propriety, be denominated petro-silex. This name is, however, to be understood as having the application given it by Kirwan,[34] who uses it to designate the fusible varieties of the hornstone of [150] Werner, and not the several varieties of compact felspar to which it has been sometimes applied. In passing from the hot springs, north-east to the leadmine country, about the sources of the Merimeg, this rock is found to be intimately connected, and to pass by minute and imperceptible gradations, into the flint rock of that district, which is decidedly secondary, and of contemporaneous origin with the compact limestone which it accompanies. About the hot springs it is not distinctly stratified, but occurs in very extensive masses, sometimes forming the body of large hills, and is marked by perpendicular seams and fissures, often placed very near each other.

The hot springs of the Washita are in north latitude 34° 31′, and west longitude 92° 50′ 45″,[35] near the base of the south-eastern slope of the Ozark mountains, and six miles north of the Washita. They have been erroneously represented as the principal sources of that river, which are more than one hundred miles distant.[36]

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[34] Richard Kirwan (1733-1812), an Irishman, ranked as one of the most brilliant scientific thinkers of his time. His studies included chemistry, geology, mineralogy, and agriculture. Many of his writings were translated into other languages.— Ed.

[35] Hunter and Dunbar.— James.

[36] The sources of Ouachita River are near the western state line in Polk County.— Ed.

We have been informed that these remarkable springs were unknown, even to the American hunters, until the year 1779. At that time, it is said, there was but one spring discharging heated water. This is described as a circular orifice, about six inches in diameter, pouring out a stream of water of the same size, from the side of a perpendicular cliff, about eight feet from its base. This cliff was situate then, as it is now, along the eastern side of a small creek, but was at a greater distance from the stream than at present. At another place, near the top of the mountain, which rises abruptly towards the east, the heated water is said to have made its appearance near the surface of the ground, in a state of ebullition, and to have sunk and disappeared again upon the same spot. It is probable these representations [151] are in a great measure fabulous; all we are to understand by them is, that the gradual augmentation of the thermal rocks, which are constantly forming about the springs, has changed the position, and perhaps increased the number of the orifices.[37]

These springs were visited by Hunter and Dunbar in 1804, and the information communicated by them, as well as much derived from other sources, together with an analysis of the waters, has been placed before the public

[37] "There are four principal springs rising immediately on the east bank of the creek, one of which may be rather said to spring out of the gravel bed of the river; a fifth, a smaller one than that above mentioned, as rising on the west side of the creek; and a sixth of the same magnitude, the most northerly, and rising near the bank of the creek; these are all the sources that merit the name of springs, near the huts; but there is a considerable one below, and all along at intervals the warm water oozes out, or drops from the bank into the creek, as appears from the condensed vapour floating along the margin of the creek, where the drippings occur." This extract from the "Observations" of Hunter and Dunbar, when compared with our account, will show that some changes have happened in the number and position of the springs, since the time of their visit in 1804.— JAMES.

by Dr. Mitchell.[38] They have been subsequently examined by Major Long, in January 1818, from whose notes we derive much of the information we have to communicate respecting them. They are about seventy in number, occupying situations at the bottom and along one side of a narrow ravine, separating two considerable hills of clay-slate. A small creek enters the ravine from the north by two branches, one from the north-west, and the other from the north-east, flowing after their union nearly due south, and blending with the water of the springs, increasing rapidly in size, and acquiring so high a temperature, that at the time of our visit the hand could not be borne immersed in it. After traversing from north to south the narrow valley containing the springs, this creek meanders away to the south-east, and enters the Washita at the distance of eight or ten miles. All the springs are within a distance of six hundred yards below the junction of the two brooks, and all, except one, on the east side of the creek.

We subjoin a note, containing some particulars observed by Major Long at the time of his visit in 1818.[39]

[38] See the New York Medical Repository.— JAMES.

Comment by Ed. Samuel Latham Mitchill (1764-1831), "the Nestor of American science," began the publication of the *New York Medical Repository* in 1797. He was a member of the faculty of Columbia College from 1792 to 1801; later he was professor in the College of Physicians and Surgeons of New York City (1808-26), and in Queen's College (1826-30). He served several terms in the New York legislature, and from 1801 to 1813 was in Congress, part of the time in the Senate.

[39] On the 1st of January, 1818, the thermometer, in the air, at sunrise, stood at 24°, at 2 P. M. 49°, at sunset 41°.

Immersed in the water of the creek, below the springs, at 61°.

In spring No. 1. being the lowermost on the creek, 122°, water discharged, 4 gallons per minute.

No. 2. A few feet from No. 1, 104°, discharges 1 gallon per minute.

During the winter the steam which rises from the springs is condensed to a white vapour, which is often visible at a great distance.

The water of the springs is limpid and colourless, and destitute, when cooled, of either taste or smell, [152] and, according to the analysis of Dr. Mitchell, purer than ordinary spring water. It however deposits, as it comes in contact with the air, a copious sediment, which has gradually accumulated until it has become an independent

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No. 3. Twenty-five yards from the last, 106°, discharges two gallons per minute.

No. 4. Six yards above the last, 126°, discharges 2 gallons per minute.

Temperature of a spring issuing from the ground, at a considerable distance up the side of the hill, 64°.

Springs, No. 5, 6, and 7, 126°, 94°, 92°. These rise very near each other, the warmest being more elevated than the rest; the three discharge about 8 gallons per minute.

No. 8. Issuing from the ground, fifty feet above the level of the creek, uniting, as it rises, with another at 54°; temperature of the mixture, 128°, discharge of the two, 10 gallons per minute.

No. 9. Rising on the point of a small spur, sixty feet above the level of the creek, 132°, discharges two gallons per minute.

No. 10. Forty feet above the creek, 151°, discharges 10 gallons per minute. Green bushes in the edge of this, which is the hottest spring.

No. 11. Three feet above the creek, 148°, discharges 12 gallons per minute.

No. 12. Twenty yards above the last, 132°, discharges 20 gallons per minute.

No. 13, 14, 15. Near the last, 124°, 119°, 108°, discharges each 4 gallons per minute.

No. 16, 122°, discharges 2 gallons per minute.

No. 17. The uppermost on the creek, 126°.

No. 18, 126°; 19, 128°; 20, 130°; 21, 136°; 22, 140°. All these are large springs, and rise at an elevation of at least 100 feet above the creek. In the same area are several others, and what is more remarkable, several cold ones. In any of the hot springs I observed bubbles rising in rapid succession, but could not discover any perceptible smell from them. Not only confervas and other vegetables grow in and about the hottest springs, but great numbers of little insects are seen constantly sporting about the bottom and sides. Temperature of the water of the creek, above the springs, 46°. The entire quantity of water flowing in the creek after it receives the water of the hot springs, may be estimated at from 900 to 1000 gallons per minute.— JAMES.

rock formation of considerable extent. This rock appears to consist of flint, lime, and a little oxide of iron. It is often of a porous or vascular texture, and the amygdaloidal cavities are sometimes empty and sometimes contain very delicate stalactites. Hæmatitic iron ore occurs disseminated in every part. Also extensive caverns, sometimes filled with a bright red metallic oxide. Dr. Wilson, who has been some time resident at the springs, informed us, that the continued use of the water occasions salivation, from which it has been commonly inferred that mercury exists in the water in solution.[40]

The time of our visit to the springs being one of very unusual drought, the quantity of water was somewhat less and the temperature higher than ordinary. The time required to boil eggs, as much as they usually are for the table, was fifteen minutes. In the same time a cup of coffee was made by immersing our kettle in one of the springs.[41]

A number of baths have been made, by hollowing out excavations in the rock, to which the hot water is constantly flowing. By cutting off or increasing the supply the temperature can be regulated at pleasure; over some of these are built small log cabins, and in the neighbourhood are twenty or thirty huts, occupied at some seasons of the year by persons who resort hither for the benefit of the waters.

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[40] Wilson must have been one of the transient residents common at this period; the first permanent settlers did not come until 1826 or 1828.— ED.

[41] The temperature was, however, no more than sufficient to raise the mercury in Fahrenheit's thermometer to 160°. It has been represented by Bringier, in a paper published in Silliman's Journal, that "the heat of the water is 192° Fah." On what observations this assertion rests we know not. See "The American Journal of Science and Arts." Vol. iii. No. I. p. 29.— JAMES.

Three miles north-east from the hot springs is a large fountain of water, of the ordinary temperature, forming the source of the small stream already mentioned as flowing down from that direction. It rises from the summit of a little knoll, six or eight feet in diameter, and divides into two streams, one of which flows towards the east, the other towards the west. Both, however, unite at the base of the knoll, and [153] the brook flows thence south-west, between two petrosiliceous hills, to its confluence with another from the north-west, to form the hot spring creek. The quantity of water discharged by this spring can scarcely be less than from eighty to one hundred gallons per minute. Immediately on the south rises a large hill, and the elevation of the spring itself, above the level of the highest of the thermal springs, is thought to be not less than one hundred and fifty feet. The water is transparent, but has a perceptible metallic taste, and deposits upon the stones over which it flows a copious rust-like sediment. The spring is known in the neighbouring settlements as the "poison spring," a name which we were told it had received from the following circumstance, said to have taken place many years since. A hunter who had been pursuing a bear, and was much exhausted with heat and fatigue, arrived at this spring in the middle of the day, and finding the water cool, and not unpleasant to the taste, drank freely of it, but immediately afterwards sickened and died. His death was occasioned, probably, not by any deleterious quality in the water, but by the disease commonly induced by drinking too largely of cold water when the body is heated. The neighbouring inhabitants, however, imputed the hunter's death to some supposed poisonous property in the spring. Not long

afterwards a discontented invalid, residing at the hot springs, came to a resolution of putting a period to his own life. This he concluded to bring about by drinking the water of the poison spring. He accordingly repaired to it, and after drinking as much as he could, filled his bottle, and returned home. Instead of dying, as he had expected, he found himself greatly benefited by his potation. Notwithstanding this discovery of the sanative quality of the water the spring still retained its former name. It is however used without apprehension, and is much resorted to by people who visit the warm springs.

[154] About two miles to the north-east of this spring, a little to the left of the road leading to the settlement of Derdonai, is the principal quarry from which the Washita oilstones are procured. It is near the summit of a high and steep hill of the petrosiliceous rock already mentioned. The oilstones are found in the perpendicular seams or fissures of the rock, from which they are detached with little difficulty, having, as they are dug from the quarry, nearly the requisite shape and size. They are then carried by hand, or thrown to the foot of the precipice, whence there is an easy transportation of ten or twelve miles to the Washita. By this river they descend to New Orleans, and some have been carried thence to New York, where they are known as the Missouri oilstones. These stones are said not to be inferior in quality to the oilstones from Turkey.

In the immediate neighbourhood of the hot springs we observed a number of interesting plants. The American holly (ilex opaca) is a conspicuous and beautiful tree in the narrow vallies within the mountains. The leaves of

another species of ilex (I. cassine), the celebrated cassine naupon frequent about the springs, are there used as a substitute for tea. The angelica tree (aralia spinosa, Ph.) is common along the banks of the creek, rising to the height of twelve to fifteen feet, and bending beneath its heavy clusters of purple fruit. The pteris atropurpurea, asplenium melanoraulon, A. ebeneum, and other filices are found adhering to the rocks. In the open pine woods the germandia pectinata, considered as a variety of G. pedicularia, is one of the most conspicuous objects.

The sources of the Washita are in a high and broken part of the Ozark mountains, in north latitude 34° 15′, and between 93° and 94° west longitude, and sixty or an hundred miles south-west of the settlement of Cadron on the Arkansa. From the same mountainous district descend towards the north-east the Petit Jean and Le Fevre, tributaries to the Arkansa; on [155] the north-west the upper branches of the Poteau; on the south-west the Kiamesha; and on the south-east the Mountain, Cossetot, Rolling Forks, and other streams, discharging into Little river of Red river.[42] The principal source of the Washita is said to be very near that of the Fourche Le Fevre, and to descend towards the west from the same hill, out of which flow the upper branches of the Le Fevre towards the east. These particulars are, however, of little importance, except as serving to illustrate the character of

[42] Little River rises in northwestern Polk County, crosses the state line into Indian Territory, and re-enters Arkansas to separate Sevier and Little River counties; it falls into Red River at the southeast corner of the latter county. Rolling Fork and Cossetot rise in southern Polk County and flow south through Sevier. Mountain Fork is one of several small streams the waters of which unite in Indian Territory to form Little River.— ED.

that portion of the country. The whole of that region is strictly mountainous, and its numerous streams are rapid and circuitous, winding their way among abrupt and craggy hills, so thinly covered with pine and post oak, that the sober gray of the sandstone is often the prevailing colour of the landscape. The hills, at the sources of the Poteau and the Kiamesha, abound in clay-slate, and a slaty petro-silex destitute of organic remains.[43] It is remarked by hunters, that the most remote and elevated sources of all the rivers of this region are joined in or near extensive woodless plains. As far as this is the case, it would seem to prove that the existing inequalities of the surface have been produced almost entirely by the currents of water wearing down and removing extensive portions of the horizontally stratified rocks. In districts where secondary rocks only are found, as in the country of the Ohio, there appears little difficulty in attributing this origin to all the hills; and even in the mountainous district under consideration, as the most recent rocks, and those of horizontal stratification, occupy the highest portions of the hills, we may perhaps be allowed to suppose they formerly covered a much greater extent of country than at present, overlaying those strata of more ancient deposition, which now appear upon the declivities of the mountains. It cannot escape [156] the remark of any person who shall visit the range of country, which we call the Ozark mountains, that the direction of the ridges, (particularly of those where sandstone is the prevailing rock,) conforms to the course of the principal streams.

None of the tributaries to the Washita, above the hot

[43] Nuttall's Travels, p. 150.— JAMES.

Comment by Ed. Page 211 of reprint in our volume xiii.

springs, have hitherto been explored. The Little Missouri and the Fourche-au-Cadeau, enter it in succession from the west, in the course of a considerable bend which it makes to the south, after receiving the waters of Hot Spring creek.[44] These two streams run mostly in a mountainous country, though some fertile lands and some settlements occur on each. On the Little Missouri, Hunter and Dunbar found the maclura, a tree confined to fertile soils. The first considerable stream entering the Washita from the north is the Saline, rising in three principal branches, twenty or thirty miles north-west of the hot springs. The road from Derdonai to the springs crosses these streams near their sources, in an extremely rugged and mountainous region. The Saline, like the Washita itself in this part, and the other tributaries already enumerated, is liable to great and sudden floods, and also to great depression in seasons of drought. Originating in a mountainous tract, and in the continuation of the range so profusely supplied with springs in the country about the sources of White river, we might expect that the Washita would be fed by numerous and unfailing fountains. It appears, however, to derive the greater

[44] Ouachita River pursues an easterly course until it enters Hot Springs County; then it turns sharply to the southwest, changing direction again on leaving the county, and flowing south-southeast until it enters Louisiana.

Fourche-au-Cadeau (now contracted to Caddo Creek) heads in Montgomery County, and flowing southeast meets the Ouachita on the northern line of Clark County. Cadeau is a corruption of Cadaux. Both words are French, the former meaning a gift, the latter being the plural of the name of an Indian tribe (Caddo in English) whose range included southwestern Arkansas. The stream is called Fourche des Cadaux (Fork of the Caddos) in Dunbar and Hunter's "Description of the Washita River" (*American State Papers*, "Indian Affairs," i, p. 731).

At the southeast corner of Clark County is the mouth of the Little Missouri, which rises on the Polk-Montgomery county line, traverses Pike, and forms the southern line of Clark.— ED.

part of its supplies from the water of rains, and consequently to rise and fall according to the time of year and the state of the weather. Where Major Long crossed the Washita, on the 31st December 1817, six miles south-west of the hot springs, the river was one hundred and fifty yards wide, about four feet deep, and extremely rapid.

In the latter part of October 1820, at the time of our journey, the Washita at Keisler's settlement, about fifteen miles below the springs, was something [157] less than one hundred yards in width, flowing in a deep and unequal channel over a bed of clay-slate. The water is here ten or fifteen feet deep in many places, and the currents scarce perceptible; as we looked down upon the river from the elevated banks it appeared like a quiet lake, and the unusual blackness of the waters suggested the idea of its great depth. Little groups of naked rocky islands were disclosed here and there in different parts of the channel. On examination we found the apparent dark colour of the water to depend upon the complexion of the rocks which form the bottom and sides of the bed, they being principally of a dark-coloured argillite; and not only these, but the small fragments of quartz and other whitish stones, had acquired, from lying in the water, a peculiar tinge of dark brown. We expected to find an incrustation covering the surfaces of these stones, but upon examination the colouring matter seemed inseparably blended with the rock itself. The water, seen by transmitted light, was entirely transparent, and had no perceptible saltness.

At the distance of five or six miles south-east from the hot springs, on the road leading towards the town of

Little Rock, on the Arkansa, commences a tract of land, having a fertile soil and a beautiful situation, and extending to the Washita. Some parts of this region afford exceptions to the remark generally applicable to Arkansa territory, that the best soils are found in the alluvion of the rivers. Some extensive districts of primary soil along the base of the mountains are of a quality rarely surpassed in fertility, bearing heavy forests of oak, ash, and sugar maple, which attain here to greater size than we have seen in other parts of the United States.

We arrived about sunset on the 28th at Keisler's plantation,[45] where we made application for permission to spend the night. This was readily granted, though, as is often the case in such remote and solitary habitations, the house was not in the most complete [158] readiness for the accommodation of travellers. A quantity of Indian corn was immediately gathered in the adjoining field, a part of it given to our horses, and a part prepared for our own supper. During the green-corn season, which is a time of jubilee and rejoicing among the agricultural Indians, and scarcely less so with many of the white settlers, those who live remote from corn mills use no other bread than such as we now saw prepared, within the space of an hour, from the standing corn. Such ears are selected as are fit for roasting, and the corn grated from the cob by means of the side of a tin lanthorn, or some portion of an old coffee-pot, perforated with several

[45] The permanent occupation of this region, outside of the village at the Hot Springs, hardly began before the middle of the nineteenth century; earlier comers were mostly hunters and trappers, who "squatted" for a time and then passed on. It is uncertain whether the individuals mentioned were of this class or were permanent settlers; their names are not in local histories. Any spot containing even a single habitation was by courtesy styled a "settlement."— Ed.

holes. In this state it forms a soft paste, which, with the addition of a little salt, is spread upon a heated stone or an iron pan, and baked before the fire. Our supper consisted of bread of this sort, bear's meat, and coffee — a treat worthy the attention of an epicure.

The Cove is a valley commencing among the mountains at no great distance to the east of the hot springs, and containing a small rivulet which enters the Washita six or eight miles below Keisler's.[46] This valley is bounded towards the west by loamy hills, disclosing at intervals cliffs and ledges of clay-slate and petrosilex. In the lowest part of this valley, at a place called Roark's settlement, we discovered a bed of granite forming the basis of a broad hill, which rose by a very gradual ascent towards the east. We were directed to the examination which brought us acquainted with the existence of this rock by the representation of Roark, that in his corn field, not far from the house, was a bed of plaister of Paris. Being conducted to the spot, we found a quantity of loose granitic soil, that had been raised from a shallow excavation, and was intermixed with numerous large scales of talc. The examination had been carried a few feet below the surface, and had terminated upon the granite in question. Having collected [159] several beautiful masses of an aggregate of felspar, talc and quartz, we returned to the house where our breakfast was in preparation. Being informed by our landlord that blue vitriol, native copper, and other interesting minerals, had been formerly discovered near the sources of the little brook that ran past the house, we delayed our journey

[46] The village of Cove Creek, on the line between Garland and Hot Springs counties, marks the entrance to this valley.— ED.

some time, that we might continue our examination. In following the brook towards its sources, we were much gratified in finding an extensive bed of native magnet, which seemed to be embraced in the granite. Not far distant the same rock contained large masses of pyrites and of bluish green mica. In these we readily perceived the blue vitriol and native copper mentioned by our host. In some places we found the bed of the brook paved almost exclusively with detached schorls. We collected also several other interesting imbedded minerals. More extensive examinations will hereafter show this spot to be one among the most interesting in America to a mineralogist. The great depth of soil resting upon this formation of granite prevented our examining it at as many points as we could wish; also from ascertaining to our satisfaction its extent, and its connexion with the neighbouring rocks. It appears, however, at several points in an area of fifteen or twenty acres, and always in place. We saw not a single detached mass at any distance. This may be owing in part to the perishable structure of the granite, and in part to its being surrounded on all sides by more elevated rocks of slate or sandstone. On the summit of the hill a grave had recently been dug. In the granitic soil which lay about it we saw many fragments of pyrites, also uncommonly large and beautiful laminæ of talc intermixed with scales of mica. These two minerals are, we think, rarely found in such intimate connexion, yet retaining so perfectly their distinctive characters, as in the instance under consideration. The talc in some instances forms an integrant part of the granite, and [160] we have seen it blended with mica in the same specimen.

The road, leading towards the Little Rock on the

Arkansa, passes from the granite of the Cove over a coarse hard sandstone, embracing beds of conglomeratic or pudding-stone, and in many respects closely resembling some of the varieties of the old red sandstone of the Alleghany mountains. Towards the east the surface of the country rises gradually, and the sandstone, without giving place to any other stratum, becomes more micaceous and slaty, and at length assumes all the characters of a sandstone accompanying coal.

In the afternoon of the 29th we arrived at Lockhart's settlement, on the Saline Fork of the Washita. The soil of some of the bottom lands along this stream is not inferior to any we have seen west of the Mississippi. It is well watered, and abounds in excellent timber. Pine and oak are intermixed with the ash, hickory, and sugar maple. Here are some well cultivated gardens, and extensive plantations of corn, cotton, and tobacco. Mr. Lockhart and his family, who are emigrants from North Carolina, consider the climate more agreeable than that of the country they came from, and have continued, during a residence of several years, to enjoy good health. We could not fail to attribute this remarkable exemption from disease, in a great measure, to the regularity, neatness, and good order of their domestic economy.

October 30th. In crossing some broken ridges of sandstone, which occupy the high and uninhabited tract between the vallies of the Arkansa and Washita, we followed the obscure path communicating between the settlements on the Saline and the town of Little Rock. As we were descending from one of these ridges our attention was called to an unusual noise, proceeding from a copse of low bushes on our right, at a few rods from

the path. On arriving at [161] the spot we found two buck deer, their horns fast interlocked with each other, and both much spent with fatigue, one, in particular, being so much exhausted as to be unable to stand. As we perceived it would be impossible they should extricate themselves, and must either linger in their present situation until they died of hunger, or were destroyed by the wolves, we despatched them with our knives, not without having first made an unavailing attempt to disentangle their antlers. Leaving their bodies in the place where we had killed them, we called at the cabin of a settler, which we found within a few miles, and requested him to go back and fetch the venison for the use of his family.

From the occasional occurrence of the skulls of deer and elk with the horns interlocked with each other, and from the fact above mentioned, it appears that the contests of these animals at the rutting season often prove fatal to both parties. From the form of the horns, and the manner of fighting, it seems probable they must often be entangled with each other, and when this is the case both fall an easy prey to the wolves.

The Saline has an entire length of about one hundred and fifty miles, running all the way nearly parallel to the Washita, to its confluence near the latitude 33° north. After entering the state of Louisiana, the Washita receives from the east the Barthelemi, the Boeuf, the Macon, and the Tensa, all of which, having their sources near the west bank of the Mississippi, may be considered as inosculating branches of that river, since at times of high floods they are fed from the Mississippi. The western tributaries are the Saluder, Derbane, and Ocatahoola, deriving their sources from a spur of the Ozark moun-

tains, which, in the northern part of Louisiana, divides the broad alluvial valley of Red river from that of the Mississippi. About twenty miles south-west from the confluence of the Tensa, Washita, and Ocatahoola, [162] the latter expands into a considerable lake, and sends off a branch to Red river. Indeed the Washita might, without great impropriety, be considered as entering the Mississippi at the point where its waters unite with those of the Ocatahoola and Tensa. The periodical inundations cover the country westward to this point, and even in times of low water the channels communicating with the Mississippi are numerous. From this point there is an uninterrupted connexion, through a system of lakes and watercourses, stretching along parallel to the Mississippi, about thirty miles distant, and communicating, through the river and lake Atchofalaya, with the gulf of Mexico, at a point more than one hundred and fifty miles west of the principal debouchure of the Mississippi.[47]

[47] James did not base this description of watercourses in Louisiana on personal observation, yet it is fairly accurate. A few comments may be added. Macon River is a tributary of the Tensas; their confluence is several miles from the Ouachita, east of the hill called Sicily Island. Opposite the mouth of the Tensas is that of the Ocatahoola (Little River); below this point the Ouachita is called Black River (*Rivière Noire*), a name given by the French on account of the dark appearance, due to depth, overshadowing forests, and a black sand bottom. The expansion of Little River is Catahoula Lake, in the county of the same name; its depth fluctuates from mere marsh to about fifteen feet. The Derbane is now Bayou Corney, a branch of which is still Bayou D'Arbonne; its mouth is nearly opposite that of the Barthelemi (Bartholomew). The Saluder is apparently Bayou Loutre (Otter), a short distance above Bayou Corney. Lake Atchafalaya (Grand Lake), an expansion of the river of the same name, is a few miles from the Gulf coast, north of Atchafalaya Bay. Recently an effort has been made to force all of the current of Red River into the Mississippi, by damming the Atchafalaya.— ED.

CHAPTER III [XI][48]

Red River — Exploring Expedition of 1806 — Return to the Arkansa — Earthquakes

THE Red river of Louisiana enters the Mississippi from the west, in north latitude 31° 5′,[49] and in 16° 35′ west longitude from Philadelphia. From the Mississippi to the mouth of Black river (as the Washita is called below the confluence of the Ocatahoola and Tensa) is twenty-six miles by water. The aggregate width of Red river, for this distance, is from three hundred to three hundred and fifty yards. The depth of the water in summer varies, according to the actual measurement of Messrs. Freeman and Humphrey, from eighty-four to forty-two feet, the range from extreme high to low-water is from twenty-five to thirty feet, and the banks are elevated from fourteen to twenty-five feet above the surface of the river at low-water. At no great distance, on each side, is a second alluvial bank, rising a few feet higher than the immediate bank of the river. Back of this the surface is elevated nearly to high-water mark, but descends gradually towards the lakes and swamps, which occur along both sides of the valley of the river. In the wet season the lower part of Red and Black rivers are lost in an extensive lake, covering the country from the Mississippi westward near one hundred miles to the settlement of the Avoyelles.[50]

[48] For the following topics mentioned in this chapter, see Nuttall's *Journal*, in our volume xiii: William Darby (note 181), Caddo Indians (103), Little Rock (123).— ED.

[49] Ellicott; 31° 1′ 15″, according to M. de Ferrer.— JAMES.
Comment by Ed. 30° 58′ 50.28″ is correct.

[50] The settlement of Avoyelles occupied an island of prairie, about forty miles in circumference, rising out of the swamp thirty or forty feet above high water. The name was that of a small tribe of Indians found there by the early French.

The distinction made by Du Pratz, between the country on the south and that on the north side of Red river, appears to be strictly applicable only to [164] the part lying below the point where Red river enters the immediate valley of the Mississippi.[51]

Above the confluence of Black river the bed of Red river immediately contracts to one hundred and twenty yards, which is its average width from this point to the rapids seventy-two miles above: the current becomes in a corresponding degree more rapid, running with a velocity of from two and a half to three miles per hour, at a moderate stage of water, in the early part of summer. The average depth in this section is stated at from eighteen to twenty feet, at a time when the water is twenty-one feet below its maximum of elevation. The banks are generally bold and steep on one side or the other, and often on both. The bottom lands are level and exceedingly fertile, but bear the marks of periodical inundation. The forests of the lower section of Red river differ little from those of the

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Acadians went thither in considerable numbers during the last fifteen years of the eighteenth century. In 1803 the inhabitants were a mixture of French, Irish, and Americans, settled around the edge of the prairie, near the woods, their houses facing the open land, which they cultivated. A decade later the population was estimated at four hundred and fifty whites and a hundred and fifty slaves.— ED.

[51] "The south side of this river, quite to the rapid part, is entirely different from the opposite side; it is something higher, and rises in proportion as it approaches the height I have mentioned; the quality is also very different. This land is good and light, and is disposed to receive all the culture imaginable, in which we may assuredly hope to succeed. It naturally produces fruit trees and vines in plenty; it was on that side muscadine grapes were found. The back parts have neater woods and meadows, intersected with tall forests. On that side the fruit trees of the country are common, and above all, the hiccory and walnut trees, which are sure indications of good soil." *Du Pratz'* Louisiana, p. 166.— JAMES.

Comment by Ed. This reference is to the second London edition (1764).

Mississippi and the Arkansa. White gum, cotton-wood, pecan, locusts, white oak, mulberry, sycamore, hackberry, and cypress occupy the low grounds, while the low and scattered hills are covered with pine, intermixed with a small proportion of oak and hickory. The only portion of the low lands in any sort fit for cultivation is a narrow strip immediately on each bank, commencing a little above the mouth of Black river, and enlarging upwards; but even here the settler is not secure, as uncommon swellings of the river sometimes lay the whole under water. Aside from this, the extreme insalubrity of the air, occasioned by the vicinity of extensive swamps, stagnant ponds, and lagoons, tends to retard the progress of settlements in this quarter.

At the rapids the river spreads to three hundred yards in width. The banks are thirty feet high, and never overflowed. Here has for many years been a settlement. The soil of the neighbouring country is extremely fertile.[52] A bed of soft sandstone, or indurated clay, crosses the river, causing a fall of ten feet [165] in fifty yards. "This stone, when exposed to the air, becomes as hard as freestone; but under water it is found as soft as chalk. A channel could, with very little labour or expense, be cut through any part of the bed of the river, and need not be extended more than two hundred yards. It appears to me that twenty men, in ten days, with mattocks only, could at low water open a channel sufficiently wide and deep for all the barges that trade in this river to pass with

[52] Sibley's report on Red River says of the settlement at the rapids (1803), "No country whatever can exhibit handsomer plantations." See *American State Papers*, "Indian Affairs," i, p. 726. There were also at that time a few settlers on the north side of the river between the rapids and Avoyelles, but none on the south side which was more subject to inundation.— ED.

safety and ease."[53] Three quarters of a mile above this rapid is another, very similar in extent and magnitude.

Thirty miles above the rapids we find the river divided into two beds, each having a high bold bank. The right-hand channel contains about one third of the volume of water of the whole river. They separate from each other four or five miles below Natchitoches, and unite again here, forming an island sixty miles long and five wide.

The right-hand branch is called by the French Rigollet Bon Dieu, and the other Old river. Another island, commencing one-fourth of a mile below Natchitoches, extends parallel to that above mentioned, thirty-four miles and a half; this is about four miles wide. The current, in all the branches which lie between these islands and the main-shore, is rapid, but not equally so. The description already given of the valley of the river is applicable to this portion; on each side the surface descends from the river, terminating in a line of pools and cypress swamps, which extend along the base of the bluff. Settlements were here somewhat numerous in 1806. The small cottages are placed near the bank of the river, and the cultivated lands extend back but a little distance. "The inhabitants," says Freeman "are a mixture of French, Spanish, Indian, and Negro blood, the latter often predominating."[54]

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[53] Freeman's MS. Report to W. Dunbar, esq.— JAMES.

[54] Compare Sibley's description of this portion of the river in 1803 (see reference, *ante*, note 52). Rigolet means a little irrigation ditch, giving the name of the east channel the curious meaning, Little Ditch of the Good God. This is now the main channel, and is sometimes called Red River; its upper mouth is four or five miles above Natchitoches, instead of below, as stated in the text. The other channel was also called Cane River. In 1803, there was a settlement of forty families on this branch, about twenty-four miles above the end of the island. Near this point the river again divides, forming Isle Brevel, so called from the first settler upon it. The branch west of this island is called Old,

[166] The separation of the water of the river into three distinct branches, each confined within high and steep banks, raised twenty and even thirty feet above the medium elevation of the water, and their reunion, after traversing severally an extent of sixty and thirty miles, might at first view appear a matter of curious inquiry; but upon the slightest investigation it will be discovered that this whole country adjacent to the river has been made or raised to its present elevated position by frequent inundation and depositions from the water. This evidently appears from the great quantities of timber frequently seen as you ascend the river, deposited as low as low-water mark, under steep banks of different heights from twelve to thirty feet.

Red river takes its name from the colour of its water, which is in time of floods of a bright red, and partakes more or less of this colour throughout the year. There can be no doubt the colouring matter on which this tinge depends is derived from the red sandstone of the salt formation already described when speaking of the sources of the Canadian river of Arkansa, although no person qualified to give a satisfactory account of the country has hitherto traced Red river to that formation. We propose to add some brief notices of this important river, derived from the unpublished materials of the exploring party sent out by

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or False, River. The other, or middle, branch was, in 1803, called Little River, its banks being thickly settled; it is now considered as the upper portion of Cane River. The upper junction of Cane and False rivers was near Natchitoches. Thus it appears that each channel has borne, or bears, two names: the east channel is Rigolet du Bon Dieu, or Red River; the middle one at Isle Brevel is Cane, or Little River; and the west one Old, or False River; while at the lower island it is Old or Cane River.

Natchitoches, now chief town of the parish of the same name, was established in 1714, by St. Denys, as a mission station; a fort was erected in 1717, under Governor Bienville.— ED.

the government of the United States in 1806; also from the notes of Major Long, who visited the upper settlements in 1817; not neglecting such additional information from the works of Darby, Nuttall, and others who have written of Louisiana, as may appear deserving of confidence.

Red river was explored at a very early period by the French, but their examinations appear to have extended no farther than to the country of the Natchitoches and the Cadoes;[55] and although subsequent [167] examinations have a little enlarged our acquaintance with its upper branches, we are still unfortunately ignorant of the position of its sources. Three years after the cession of Louisiana to the United States, a small party, known by the name of the "Exploring Expedition of Red river," and consisting of Captain Sparks, Mr. Freeman, Lieut. Humphrey, and Dr. Custis, with seventeen private soldiers, two non-commissioned officers, and a black servant, embarked from St. Catherine's landing, near Natchez, on board several barges and small boats, with instructions to ascend Red river to its sources.[56] On the 3d of May 1806

[55] In 1700 M. de Bienville ascended the Red river to the country of the Natchitoches and Yatassee Indians, but could find no Spanish establishments in that quarter. The Yatassee village was about forty miles north-west of the present town of Natchitoches, in the settlement of Bayou Pierre.

Darby, on the Authority of La Harpe.— JAMES.

Comment by Ed. See Margry, *Découvertes et Établissements des Français*, vi, pp. 241-307.

[56] The official report of the expedition under Captain Sparks was never published, and the account here given is the only one extant, drawn from the notes of the party. Richard Sparks, the leader, first saw service in the "levies of 1791," under Gen. Arthur St. Clair. The next year he was made captain in the infantry, and later promoted to major (1806) and lieutenant-colonel (1807). During the War of 1812-15 he was colonel in the Second Infantry; at the close of the war he received an honorable discharge and died the same year (1815).

Freeman's given name was probably Thomas, but nothing more is known about him. "Lieutenant Humphrey" was probably Enoch Humphreys, of

they entered Red river, expecting to be able to ascend with their boats to the country of the Pawnee Piqua Indians. Here it was their intention to leave their boats, and packing their provision on horses which they should purchase of the Pawnees, they were to "proceed to the top of the mountains," the distance being, as they believed, about three hundred miles.

On the 19th of May they arrived at Natchitoches, distant from the Mississippi 184 miles 266 perches, measured by log-line and time. At this place they delayed some days; and having received information that their progress would be opposed by the Spaniards, they resolved to increase the strength of their party by retaining a detachment which had been ordered by the secretary at war to join them at Natchitoches, "for the purpose of assisting the exploring party to ascend the river to the upper end of the Great Raft, and to continue as far afterwards as might appear necessary to repel by force any opposition they might meet with." Accordingly, twenty men were selected from the garrison at Natchitoches, and, under the command of Lieutenant Duforest,[57] joined the exploring [168] party. They were now thirty-seven in number aside from the officers, and were furnished with a supply of flour sufficient for nine months' provision. On the 2d of June they left Natchitoches, and proceeded towards their destination. The journal of their tour by Mr. Freeman,

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Connecticut, who entered the First Artillerists and Engineers in 1801 as lieutenant. He became an artillery captain in 1809, and remained in this branch of the service until his death in 1825, being breveted major for gallant conduct at New Orleans in 1814.— Ed.

[57] John Joseph Duforest, of Louisiana, was an ensign in the Second Infantry in 1805, was promoted to a second lieutenancy in 1806, and two years later became first lieutenant. His death occurred in 1810.— Ed.

which has been obligingly put into our hands by General D. Parker,[58] is extremely circumstantial, and embraces much valuable information. We make use of it, without particular reference, whenever we have occasion to speak of that part of Red river visited by the expedition. On the 7th of June the party were overtaken, near a small village of Natchitoches and Paskagoulas,[59] by an Indian guide and interpreter, whom they had hired at Natchitoches. He brought a letter from Dr. Sibley,[60] the Indian agent, giving information that a detachment of Spanish troops were already on their march from Nacogdoches,[61] with a design to intercept the exploring party. At the distance of one hundred and two miles above Natchitoches they left the bed of the river, turning out through one of those numerous communications called Bayous, which

[58] Daniel Parker (1782-1846) graduated from Dartmouth (1801), became chief clerk in the war department (1810), and then brigadier-general, adjutant and inspector-general (1814). Later, for one year (1821), he was paymaster-general. Meanwhile he published a register of the army (Washington, 1816). In 1841 he returned to his former position of chief clerk in the war department.— Ed.

[59] The Natchitoches (whence the name of the town) were a small tribe of Caddo stock, who dwelt on upper Red River. In 1805 only thirty souls remained of this tribe; they lived in a village on Black Lake, north of Natchitoches. A hundred years earlier, they were said to have numbered six hundred men.

The Paskagoulas (Pascagoulas) were one of several small tribes of Siouan stock, who lived south of the main territory of the family, near the gulf. In 1805 they had a village on Red River, about sixty miles below Natchitoches, whither they had come from Pascagoula River, Mississippi.— Ed.

[60] John Sibley had been a surgeon in the Revolutionary War. His account of Red River (1806) has been cited in foregoing notes. He was the father of George C. Sibley (see Bradbury's *Travels*, in our volume v, note 36).— Ed.

[61] Nacogdoches, seat of the Texas county of the same name, was established in 1716, as a Spanish mission post; the mission Indians were removed to San Antonio in 1772. Spanish garrisons occupied Nacogdoches for many years, and kept watch on the movements of the French across the border, at Natchitoches, and, after the cession of Louisiana to the United States, of the Americans in that quarter.— Ed.

connect the principal channel with those lateral chains of lakes, pools, swamps, and marshes, which extend along the sides of the valley. Their design in leaving the river was to avoid that singular obstruction to the navigation called the Great Raft, having been informed by Mr. Toolan, an old and respectable French inhabitant, that it would be impossible for them to pass through it. They had already encountered three similar obstructions, through which they had made their way with extreme toil, by loosening and floating out the logs and trunks of trees, that had been piled upon each other in such numbers as to fill the bed of the river from the bottom, usually at the depth of thirty feet, and rising three or four feet above the surface of the water.

The Bayou Datche, as the part of the river is called into which they entered, conducted them to a [169] beautiful lake called Big Broth.[62] It is thus described by Mr. Freeman. "This beautiful sheet of water extends, from the place we first entered it, seventy miles in a north-westerly direction; and, as far as we saw it, is beautifully variegated with handsome clumps of cypress trees thinly scattered in it; on the right-hand side it is bounded by high land, which ascends from the surface of the water, and at the distance of one hundred yards is elevated about forty feet, and covered with forests of black oak, hickory, dog-wood, &c.; soil good second-rate. It is bounded on the left by a low plain covered with cypress trees and bushes. The depth of water is from two to six feet. High-water mark ten feet above the present surface. It is called by the Indians *Big Broth*, from the vast quantities of froth seen floating on its surface at high water. The pas-

[62] Lake Bistineau.— JAMES.

sage out of this lake is by a very difficult communication, through bayous, into another very handsome lake of about one mile wide called Swan lake, and so on, through long crooked bayous, lakes, and swamps, full of dead standing timber." Having made their way for many days along this chain of lakes, they were at length anxious to return to the river. After searching several days for a passage, and finding their pilot incapable to direct them, they resolved to wait while they could send messengers by land to the Coashatay village,[63] and procure a guide. The return of this messenger brought them some information calculated to aid in extricating themselves from the labyrinth of lakes in which they were bewildered, also the promise of the Coashatay chief, that he would join the party himself, and conduct them to the river. This promise, however, it was not his intention to fulfil. The party therefore, on the 20th of June, resumed their search for a passage, returning some distance on their route. [170] On the 25th they discovered a narrow and obstructed channel, through which, after removing several rafts, trees, &c. they found their way into the river. "Thus," says the journal of the expedition, "after fourteen days of incessant fatigue, toil and danger, doubt and uncertainty, we at length gained the river above the Great Raft, contrary to the decided opinion of every person who had any knowledge of the difficulties we had to encounter."[64]

[63] Coshatta, *Darby, &c.*— JAMES.

Comment by Ed. The Coshatta tribe was of Muskogee stock; they came to Louisiana at the close of the eighteenth century from east of the Mississippi, and established their chief village on Sabine River, about eighty miles south of Natchitoches; at that time they numbered about two hundred souls.

[64] The accumulation of drift known as the Great Raft began near Campti, in Natchitoches Parish, and extended a hundred miles or more up the river. At places the drift was covered with soil which supported a considerable growth,

The distance from Natchitoches to the point where the party entered Red river, above the Great Raft, is two hundred and one miles by the meanders of their route. Above the Raft the river is two hundred and thirty yards wide, thirty-four feet deep, and has a very gentle current. The banks are ten or twelve feet high. On the north side the lands rise considerably at a little distance, and are covered with heavy forests of oak, poplar, and red cedar. At the Coashatay village, about twenty miles above the Great Raft, the commander of the exploring party received information, by an express, from the chief of the principal village of the Cadoes, which is thirty miles farther to the west, "that about three hundred Spanish dragoons, with four or five hundred horses and mules, were encamped near that village, with the design to prevent the further progress of the Americans." The Coashatay and Cadoe Indians of this part of Red river are an agricultural half-civilized people, like the Cherokees.[65]

On the 1st of July a messenger arrived at the encampment of the party, near the Coashatay village, giving information of the near approach of the Cadoe chief, with forty young men and warriors of his village. About noon

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including even small trees; it is said that the river might at some places be crossed without the water beneath being seen; while at other places the drift was open, sometimes for several miles. The national government began the work of removing the obstruction in 1832, and by 1840 had cleared the river. Constant labor has been required, however, to keep the channel open; neglect has repeatedly resulted in the formation of new rafts many miles in length. As intimated in the text, it was possible to pass around the raft by water, through the side bayous and lakes connected with the river.— Ed.

[65] The Caddo Indians here mentioned were an important tribe of the stock of the same name. In 1806 their home was on Caddo Lake, which lies partly in Caddo County, Louisiana, and partly in Texas. The tribe went thither about 1790 from northeastern Texas, where they had dwelt from time immemorial.— Ed.

they made their appearance on the opposite bank of the river, and kept up, for a few minutes, an irregular firing by way of salute. This was returned both from the camp and the village, in a manner highly gratifying to the Cadoe party. The [171] customary ceremonies used in meeting Indians being past, an exchange of complimentary speeches followed.

The Cadoe chief expressed great uneasiness on account of the Spaniards who were encamped near his village. Their commandant, he said, had come to see him, had taken him by the hand, and asked him, if he loved the Americans; he answered, he did not know what to say, but if the Spaniards wished to fight the Americans, they might go down to Natchitoches, and fight them there; but they should not shed blood in his territories. He said he was pleased with what he had heard respecting the designs of the exploring party; he wished them to go on and see all his country, and all his neighbours. "You have far to go, and will meet with many difficulties, but I wish you to go on. My friends, the Pawnees, will be glad to see you, and will take you by the hand. If you meet with any of the Huzaa's (Osages), and kill them, I will dance for a month. If they kill any of your party, I will go with my young men and warriors, and we will be avenged for you." The soldiers belonging to the expedition having paraded in open order and single file, the forty young Cadoes commenced on the right of the line, and marching towards the left, shook each man by the hand in the most earnest manner. When their leader had reached the other extremity of the line, they instantly placed themselves in a corresponding line, about three paces distant, and

their partizan or principal warrior delivered a short address to the serjeant.

"Here we are," said he, "all men and warriors shaking hands together, let us hold fast, and be friends for ever." It was said by the interpreter he prefaced his observation by saying, he was glad to see that his new brothers had the faces of men, and looked like men and warriors.

After a delay of a few days the Cadoe chief, professing the most friendly disposition towards the exploring [172] party, withdrew with his young men to his own village. On the 11th of July the officers of the party, having as yet no certain knowledge of the designs of the Spaniards, re-embarked on board their little fleet, and began to ascend Red river from the Coashatay village, having engaged the Cadoe chief to watch the motions of the Spanish troops, and to give timely notice of any thing interesting to the expedition. The river, above the Coashatay village, became very crooked and wide, and the water was so low that the boats were often aground, though they drew no more than from sixteen to twenty inches of water.

On the 26th of July, in the afternoon, three Indians appeared on the sand-beach, who were found to be the runners sent from the Cadoe chief, agreeable to previous engagement. They brought information that the Spaniards had returned to Nacogdoches, for a reinforcement and new instructions; that six days since they had arrived at the Cadoe village, about one thousand strong; that they had cut down the United States' flag in the Cadoe village, and had said, it was their intention to destroy the exploring party. They had

taken from the Cadoe village two young men to conduct them to a handsome bluff, a few miles above where they were now encamped, to await the arrival of the party. The Indian messengers, and the Cadoes who had remained with the party, appeared much alarmed, and intreated the commanding officer to return, saying, if they met the Spaniards, not one would come back alive. The distance to the Spanish camp was three days' journey. On the following day the party made a deposit of some of their most important papers, with a small stock of ammunition, provisions, and astronomical instruments in a retired place, that they might not be entirely destitute of resources after the contemplated rencontre with the Spaniards should have taken place. At sunset, on the 28th of July, as they were [173] about to encamp, they heard several guns a-head of them, which left no doubt that they had arrived near the Spanish camp. On the ensuing morning Captain Sparks, Mr. Freeman, and a favourite Indian, walked a-head of the boats, along the sand-beach, with their guns in their hands. The Indian soon discovered some tracks, ran hastily up among the bushes on the bank, and then returning, made signs that the Spaniards were there. The party was now halted, the arms examined, and put in readiness for immediate action; then all went on board the boats, and they continued their ascent, as if they had known nothing of the Spanish troops. The advanced guard which the Indian had discovered consisted of twenty-two men, stationed a mile and a half below the encampment of the main body. On seeing the boats they fled instantly, and hid themselves in the woods, leaving behind their clothes and provisions.

On turning the next bend they commanded a beautiful view of the river, extending about a mile, with steep banks on both sides, and level sand beaches, occupying more than half the bed of the river. On one of these, at the distance of half a mile, they discovered a sentinel, and soon afterwards saw a detachment of horse gallop from thence through the small cotton-wood bushes near the next bend of the river, and shortly after return to their former station. As it was now the middle of the day, the exploring party halted according to custom, and kindled fires to prepare their dinner.

About half an hour after they had halted, a large detachment from the Spanish camp were seen riding down the sand-beach, enveloped in such a cloud of dust that their numbers could not be accurately estimated. The soldiers belonging to the exploring party were sent to take possession of a thick cane brake on the immediate bank of the river, at a short distance above the boats, to be in readiness, should there be occasion, to attack the advancing party on [174] their flank. A non-commissioned officer and six men were sent still farther up the river, and ordered to be in readiness to assail the Spaniards in the rear.

The advancing party of horse came on at full speed, and neglecting the first challenge of the two sentinels stationed at some distance in advance of the boats. When the sentinels cried "halt" the second time, they cocked their pieces, and were in the act of presenting them to fire, when the Spanish squadron halted, and displayed on the beach about one hundred and fifty yards distant. Their officers moved slowly forward, and were met by Captain Sparks, whom the Spanish commandant politely

saluted, and a parley ensued, which continued about three-quarters of an hour. The Spaniards being greatly superior in numbers, and expressing a determined resolution to fulfil their orders, which were to prevent, at all hazards, the farther progress of the exploring expedition, the officers of that party reluctantly consented to relinquish their undertaking. The spot where this interruption took place is two hundred and thirty miles by water above the Coashatay village, consequently six hundred and thirty-five miles above the mouth of Red river.[66]

Below this point it appears the river and the country lose, in a great measure, the peculiar characters which belong to the region of recent alluvial lands near the mouth of the river. Swamps, bayous, and lagoons, are less frequent; the forests are more open, the trees smaller, and the soil less fertile and open; meadows more frequent here than below. A portion of Red river above, between this point and the upper settlements,[67] is but imperfectly known.

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[66] The spot where Sparks's party was stopped must have been near Little River (of the North); the account is too indefinite to permit an exact statement. In this same year, Pike and his companions were arrested on the upper Rio Grande and taken to Santa Fé. Several recent events had aroused the apprehension of the Spanish authorities; in 1801 one Nolan had led a filibustering expedition into Texas, and Burr's conspiracy aimed, probably, at the Spanish dominions, had not yet been forgotten. Information of the proposed expeditions under Pike and Sparks had reached the Spanish officials before the Americans had completed their preparations, and Pike found upon reaching the Pawnee village on Republican River that a large body of Spanish cavalry had preceded him in visiting the tribes of the Great Plains. During his detention by the Spanish, he learned that this party had been sent out primarily to intercept and turn back both American explorers. They themselves, however, were not only to make explorations within the bounds of the United States, but to renew their former friendship with the Indians in our territories.— ED.

[67] Under the French régime, a fort was built near the old Caddo village, and several families settled in the vicinity. This was known as the "upper settle-

The average direction of Red river, as far as it has been hitherto explored, from the confluence of the Kiamesha, in latitude 33° 30′, to its junction with the Mississippi in 31° 5′, is from north-west to south-east. Above the Kiamesha it is supposed to flow more directly from west to east. The streams tributary [175] to Red river are comparatively small and few in number. Above the Washita the principal are the Little river of the south and the Little river of the north,[68] both entering near the north-western angle of the state of Louisiana, and both hitherto little known. The next in order is the Kiamesha, rising in the Ozark mountains, opposite the Poteau, and entering Red river about one thousand miles from the Mississippi. The Kiamesha has been explored from its sources to its confluence by Major Long, who first visited it in 1817. The country about the sources of this river is mountainous, being broken into numerous irregular peaks and ridges, of an old ferruginous sandstone, with its stratifications highly inclined towards the south. The timber in the mountainous country is the yellow pine, intermixed with red, white, and mountain oak, the small chesnut, the American box or hop hornbeam (ostrya virginica), the red cedar, &c.

In the low lands, towards Red river, all the forest

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ments;" but about 1780 the French families abandoned the location and removed to Campti, a few miles above Natchitoches. For many years thereafter Campti was the "upper settlement;" but in 1818 there were twenty families at the mouth of the Kiamichi and a dozen more a few miles below, at Pecan Point.— Ed.

[68] Little River of the South, so called to distinguish it from Little River (of the North), is the present Sulphur Fork of Red River. Its course is eastward, parallel to the Red, into which it falls in Miller County, Arkansas. For Little River, see *ante*, note 42. Notes on the Poteau and Kiamichi are given in Nuttall's *Journal*, our volume xiii (169, 177).— Ed.

trees common to the valley of the Arkansa are found, with the addition of the maclura, which is now so rare about the Arkansa that it can scarcely be said to make a part of the forests there. Extensive prairies exist on the lower part of the Kiamesha, some of which command delightful views of the surrounding country. Before you lies the great valley of Red river, exhibiting a pleasing variety of forests and lawns; beyond rises the gentle slope of the Ozark mountains, imprinting the broad outline of their azure summits upon the margin of the sky. At the mouth of the Kiamesha, Red river is about two hundred yards wide. Its course is meandering, forming points alternately on the right and left, terminating in sand-bars, covered with red mud or clay, deposited from the water of the river. In its lowest stage the river may be forded at any place, so that a person may pass along the bed, as in the Canadian, by travelling on the sand-bars, and occasionally crossing the water [176] between them. The soil and climate of Red river are said to be peculiarly adapted to the culture of cotton. The crop sometimes yields twenty-five hundred pounds of seed-cotton per acre, and this of a quality inferior to none, except the Sea island.

Of the Vaseau, or Boggy Bayou, and the Blue river, two considerable streams tributary to Red river, next above the Kiamesha, we have little information. They appear to enter like what are called the north and south forks of the Canadian, near the foot of the western slope of the Ozark mountains. Above these the principal tributary is the Faux Ouachitta, or False Washita, from the north, which has been described to us (by Mr. Findlay, an enterprising hunter, whose pursuits often led him to

visit its banks), as bearing a very near resemblance to the Canadian river of Arkansa.[69]

We are as yet ignorant of the true position of the sources of Red river; but we are well assured the long received opinion, that its principal branch rises "about thirty or forty miles east of Santa Fé," is erroneous.

Several persons have recently arrived at St. Louis in Missouri, from Santa Fé, and, among others, the brother of Captain Shreeves, who gives information of a large and frequented road, which runs nearly due east from that place, and strikes one of the branches of the Canadian, [and] that at a considerable distance to the south of this point in the high plain is the principal source of Red river. His account confirms an opinion we had previously formed, namely, that the branch of the Canadian explored by Major Long's party, in August 1820, has its sources near those of some stream which descends towards the west into the Rio Del Norte, and consequently that some other region must contain the head of Red river. From a careful comparison of all the information we have been able to collect, we are satisfied that the stream on which we encamped on the 31st of August [July] is the Rio Raijo [Rojo] of Humboldt, [177] long mistaken for the source of the Red river of Natchitoches, and that our camp of September [August] 2d was within forty or fifty miles east from Santa Fé. In a region of red clay and sand, where all the streams have nearly the colour of arterial

[69] Boggy (Vaseux) River rises in the Shawnee Hills, very near the main stream of the Canadian, and flows southeast; its mouth is opposite Lamar County, Texas. Blue River is a smaller stream; its course is parallel to that of Boggy River, and its mouth is near the ninety-sixth meridian. The False Washita has already been described (preceding volume, note 66), and the sources of Red River indicated (*ibid.*, note 52).— Ed.

blood, it is not surprising that several rivers should have received the same name; nor is it surprising that so accurate a topographer as the Baron Humboldt, having learned that a Red river rises forty or fifty miles east of Santa Fé, and runs to the east, should conjecture it might be the source of the Red river of Natchitoches. This conjecture (for it is no more) we believe to have been adopted by our geographers, who have with much confidence made their delineations and their accounts correspond to it.[70]

In relation to the climate of the country on Red river we have received little definite information. The journal of the Exploring Expedition contains a record of thermometric observations for thirty-six days, commencing with June 1st, 1806, and extending to July 6th. These were made between Natchitoches and the Coashatay village; and the temperature, both of the air and the water of the river, are noted three times per day, at 6 A.M. and 3 and 9 P.M. They indicate a climate extremely mild and equable. The range of atmospheric temperature is from 72° to 93° Fah. that of the water from 79° to 92°. The daily oscillations are nearly equal, and the aggregate temperature rises slowly and uniformly towards midsummer.

From Lockhart's settlement on the Saline river of Washita to Little Rock on the Arkansa, is a distance about

[70] Rio Rojo (Red River) was the Spanish name for the upper Canadian — the portion marked Rio Mora on the map — but Long's party struck the Canadian considerably to the east of this portion (see preceding volume, note 71). However, the same name was commonly given to other streams. Humboldt's conjecture was that the Pecos (which had not been explored to its mouth) was the upper course of Red River of Natchitoches. See *Political Essay on the Kingdom of New Spain* (London, 1811), ii, p. 313. The headwaters of the Pecos lie between the upper Canadian and Santa Fé.— ED.

twenty-five miles. As we approached the Arkansa, we found the country less broken and rocky than above. The soil of the uplands is gravelly and comparatively barren, producing almost exclusively scattered forests of oak, while along the streams are small tracts of extremely fertile bottom lands. In some of the vallies, however, the cypress appears filling extensive swamps, and imparting a gloomy and [178] unpromising aspect to the country. This tree is well known in all the southern section of the United States, to indicate a low and marshy soil, but not universally one which is irreclaimable. It is rarely if ever met with north of the latitude of 38°. In many respects, particularly in the texture, firmness, and durability of its wood, and in its choice of situation, it resembles the white cedar[71] of the northern states, but far surpasses it in size, being one of the largest trees in North America. "There is," says Du Pratz, "a cypress tree at Baton Rouge, which measures twelve yards round, and is of prodigious height." In the cypress swamps, few other trees, and no bushes are to be seen, and the innumerable conic excrescences called knees, which spring up from the roots, resembling the monuments in a church-yard, give a gloomy and peculiar aspect to the scenery of those cypress swamps. The old error of Du Pratz, with regard to the manner of the reproduction of the cypress, is still maintained by great numbers of people who never heard of his book. "It renews itself," says he, "in a most extraordinary manner:— A short time after it is cut down a shoot is observed to grow from one of its roots, exactly in the form of a sugarloaf, and this sometimes rises ten feet high before any leaf appears; the

[71] Thuja occidentalis.— JAMES.

branches at length rise from the head of this conical shoot."[72] We have often been reminded of this account of Du Pratz, by hearing the assertion among the settlers, that the cypress never grows from the seed; it would appear, however, that he could have been little acquainted with the tree, or he would have been aware that the conic excrescences in question spring up and grow during the life-time of the tree, but never after it is cut down.

At Little Rock, a village of six or eight houses, we found several of the members of a missionary family [179] destined to the Osages. They had exposed themselves during the heat of summer to the pestilential atmosphere of the Lower Mississippi and Arkansa; and we were not surprised, when we considered their former habits, to find they had suffered most severely from their imprudence. They had all been sick, and two or three of their number had died; the survivors, we understood, were on the recovery. They had been some time at Little Rock, the water in the Arkansa having fallen so low as to render their further ascent impracticable.[73]

The village of Little Rock occupies the summit of a high bank of clay-slate on the south-west side of the Arkansa. Its site is elevated, and the country immediately adjoining, in a great measure, exempt from the operation of those causes which produce a state of the

[72] P. 239 [London edition, 1774].— JAMES.

[73] This missionary "family" consisted of nine men, eight women, and four children, sent out by the United Foreign Missionary Society under the leadership of a clergyman named Vaill. The illness of most of the party was nothing worse than ague and bilious fever; but two of the young women were attacked by typhus fever, and died a few days after reaching Little Rock, where they arrived on July 23. Low water detained the missionaries there until the following January; then they proceeded up the Arkansas, and established Union Mission on the Neosho River, twenty miles from the Arkansas.— ED.

atmosphere unfavourable to health. It is near the commencement of the hilly country, and for a part of the year will be at the head of steam-boat navigation on the Arkansa. The country in the rear of the projected town is high, and covered for the most part with open oak forests.

October 3d. We left Little Rock at an early hour, taking the road towards Davidsonville. This led us for about four miles through the deep and gloomy forests of the Arkansa bottoms. Here we saw the ricinus palma christi growing spontaneously by the road side, and rising to the height of twelve or fourteen feet. We arrived at Little Red river by about nine o'clock, the distance from the Arkansa being not more than eight or nine miles. In the high and rocky country about White river, we fell in with the route which had been pursued by Major Long and his party, and following this, we reached Cape Girardeau a few days after their arrival. The distance from Belle Point to Little Rock by the way of the hot springs is two hundred and ten miles, from Little Rock to Cape Girardeau three hundred; in the whole, five hundred and ten miles.

[180] Major Long's notes of a tour in the Arkansa territory contain tables of meteorological observations, showing the variations of temperature from September 30th, 1817, to January 31st, 1818. The country in which these observations were made, is that between the Arkansa at Fort Smith, and the Red river at the mouth of the Kiamesha, about the hot springs of the Washita, the settlement of Cadron, &c. Here we find in the month of January the mercury at zero, and shortly after at 58°, a degree of cold that would not discredit the climate of Moscow, and a rapidity of change and violence of vicissi-

tude to compare with the ever-varying temperature of the Atlantic states. We might expect in the latitude of 34°, and in a region placed along the south-eastern slope of a moderately elevated range of mountains, a mild and equable climate. But almost every portion of the territory of the United States seems alike exposed to the influence of the western and north-western winds, refrigerated in their passage over the wide and frozen regions of the Rocky Mountains, and rushing down unobstructed across the naked plains of the great desert, penetrating with almost unmitigated rigour to the Atlantic coast. It is proper to remark, that the winter of 1817-18 was considered one of unusual severity in the Arkansa territory. From the accounts of Hunter and Dunbar, it appears, that in December 1804 the weather was much milder in the same portion of country. An alligator was seen in December many miles above the confluence of the Saline Fork, and even at the hot springs many plants were in flower, and the ground in the woods had considerable appearance of verdure. We have been assured by emigrants from North Carolina, that the winter temperature of the country, about the upper branches of the Washita, is more mild and equable than that of the corresponding latitudes on the Atlantic coast.

[181] On the 12th October the exploring party were all assembled at Cape Girardeau. Lieutenant Graham, with the steam-boat Western Engineer, had arrived a day or two before from St. Louis; having delayed there some time subsequent to his return from the Upper Mississippi. In the discharge of the duties on which he had been ordered, Lieutenant G. and all his party had suffered severely from bilious and intermitting fever.

A few days subsequent to our arrival at Cape Girardeau, the greater number of those who had been of the party by land, experienced severe attacks of intermitting fever; none escaped, except Captain Bell, Mr. Peale, and Lieutenant Swift. Major Long and Captain Kearney, who had continued their journey immediately towards St. Louis, were taken ill at St. Genevieve, and the latter confined some weeks. The attack was almost simultaneous in the cases of those of the party who remained at Cape Girardeau; and it is highly probable we had all received the impression which produced the disease nearly at the same time. The interruption of accustomed habits, and the discontinuance of the excitement afforded by travelling, may have somewhat accelerated the attack. We had observed that we had felt somewhat less than the usual degree of health, since breathing the impure and offensive atmosphere of the Arkansa bottoms about Belle Point, and there we have no doubt the disease fastened upon us. In every instance, we had the opportunity of observing, the attack assumed the form of a daily intermittent. The cold stage commenced with a sensation of languor and depression, attended with almost incessant yawning, and a disinclination to motion, soon followed by shivering, and a distressing sensation of cold. These symptoms pass off gradually, and the hot stage succeeds. The degree of fever is usually somewhat proportioned to the violence of the cold fit, the respiration becomes full and frequent, the face flushed, the [182] skin moist, and the patient falls into a heavy slumber; on awaking, after some time, extreme languor and exhaustion are felt, though few symptoms of fever remain. This routine of most uncomfortable feelings, commencing at

nine or ten in the morning, occupied for some time the greater part of our days. Late at evening, and during the night, we suffered less. Intermitting fevers are of such universal occurrence in every part of the newly-settled country to the west, that every person is well acquainted with the symptoms, and has some favourite method of treatment. A very common practice, and one productive of much mischief, is that of administering large draughts of whiskey and black pepper previous to the accession of the cold stage. Applications of this kind may sometimes shorten the cold fit, but the consequent fever is comparatively increased, and the disease rendered more obstinate. The Peruvian bark is much used, but often so injudiciously as to occasion great mischief.

Cape Girardeau, formerly the seat of justice for a county of the same name, is one of the oldest settlements in Upper Louisiana, having been for a long time the residence of a Spanish intendant or governor. Occupying the first considerable elevation on the western bank of the Mississippi, above the mouth of Ohio, and affording a convenient landing for boats, it promises to become a place of some little importance, as it must be the depôt of a fertile district of country, extending from the commencement of the great swamps on the south-east to the upper branches of the St. Francis. The advantages of its situation must be considered greater than those of the settlements of Tyawapatia and New Madrid, which are not sufficiently elevated. It is at the commencement of the hilly country, extending up the Mississippi to the confluence of the Missouri, north-west of the Gasconade and Osage rivers, and south-west to the province of Texas. Two or three miles below Cape [183] Girardeau the cy-

press swamps commence, extending with little interruption far to the south.

The town comprises at this time about twenty log-cabins, several of them in ruins, a log-jail no longer occupied, a large unfinished brick dwelling, falling rapidly to decay, and a small one finished and occupied. It stands on the slope, and part of the summit of a broad hill, elevated about one hundred and fifty feet above the Mississippi, and having a deep primary soil resting on horizontal strata of compact and sparry limestone. Near the place where boats usually land is a point of white rocks, jutting into the Mississippi, and at a very low stage of water producing a perceptible rapid. These are of a white sparry limestone, abounding in remains of encrini and other marine animals. If traced some distance, they will be found to alternate with the common blue compact limestone, so frequently seen in secondary districts. Though the stratifications of this sparry limestone are horizontal, the rock is little divided by seams and fissures, and would undoubtedly afford a valuable marble, not unlike the Darling marble quarried on the Hudson.

The streets of Cape Girardeau are marked out with formal regularity, intersecting each other at right angles; but they are now in some parts so gullied and torn by the rains, as to be impassable; in others, overgrown with such thickets of gigantic vernonias and urticas, as to resemble small forests. The country, back of the town, is hilly, covered with heavy forests of oak, tulip-tree, and nyssa, intermixed in the vallies with the sugar-tree and the fagus sylvatica, and on the hills, with an undergrowth of the American hazel, and the shot-bush or angelica

tree. Settlements are considerably advanced, and many well-cultivated farms occur in various directions.

Two or three weeks elapsed previous to Major Long's return from St. Louis; when, notwithstanding his ill health, he left Cape Girardeau immediately, as [184] did Captain Bell, both intending to prosecute, without delay, their journey to the seat of government.

About the 1st of November, Messrs. Say, Graham, and Seymour had so far recovered their health, as to venture on undertaking a voyage to New Orleans on their way home. They left Cape Girardeau in a small boat, which they exchanged at the mouth of the Ohio for a steamboat about to descend the Mississippi. Mr. Peale, who had escaped the prevailing sickness, accompanied them, leaving only Dr. James and Lieut. Swift with the steamboat Western Engineer at Cape Girardeau. Lieut. Swift had received instructions, as soon as the water should rise sufficiently, to proceed with the boat to the Falls of Ohio, where it was to remain during the winter.

Early in November, the frosts had been so severe at Cape Girardeau, that the leaves were fallen, and the country had assumed the aspect of winter. On the 9th, at four P. M. the shock of an earthquake was felt. The agitation was such as to cause considerable motion in the furniture and other loose articles in the room where we were sitting. Before we had time to collect our thoughts and run out of the house, it had ceased entirely; we had therefore no opportunity to form an opinion of its direction. Several others occurred in the time of our stay at the Cape, but they all happened at night, and were all of short duration. "Shakes," as these concussions are called by the inhabitants, are in this part of the country

extremely frequent, and are spoken of as matters of every day occurrence.[74] Several houses in and about Cape Girardeau have formerly been shaken down, forests have been overthrown,[75] and other considerable changes produced by their [185] agency. Their effect upon the constantly varying channels and bars in the bed of the Mississippi must doubtless be very important.

These concussions are felt through a great extent of country, from the settlements on Red river and the Washita to the falls of Ohio, and from the mouth of the Missouri to New Orleans. Their great extent, and the very considerable degree of violence with which they affect not only a large portion of the valley of the Mississippi, but of the adjacent hilly and mountainous country, appear to us most clearly to indicate that they are produced by causes far more efficient and deep-seated than "the decomposition of beds of lignite or wood-coal situated near the level of the river, and filled with pyrites," according to the suggestion of Mr. Nuttall.[76] It has been repeatedly asserted, that volcanic appearances exist in the mountainous country between Cape Girardeau and the

[74] Several persons, passengers on board a steam-boat, ascending the Mississippi, in 1820, went on shore near New Madrid. In one of the houses which they entered they found a small collection of books: as they were amusing themselves with the examination of these, they felt the house so violently shaken, that they were scarce able to stand upon their feet; some consternation was of course felt, and as several of the persons were ladies, much terror was expressed; "Don't be alarmed," said the lady of the house, "it is nothing but an earthquake."— JAMES.

[75] The forest adjoining the settlement of Little Prairie, below New Madrid, presents a singular scene of confusion; the trees standing inclined in every direction, and many having their trunks and branches broken.— JAMES.

[76] See Mississippi Navigator, p. 180.— JAMES.

Comment by Ed. See the account of the earthquake of 1811 in Bradbury's *Travels*, in our volume v, pp. 204 *et seq.*

hot springs of the Washita, particularly at the latter place; but our observation has not tended to confirm these accounts; and Hunter and Dunbar, who spent some time at the hot springs, confidently deny the existence of any such appearances in that quarter. Reports have been often circulated, principally on the authority of hunters, of explosions, subterraneous fires, blowings and bellowings of the mountains, and many other singular phenomena, said to exist on the Little Missouri of Washita, and other parts of the region of the hot springs; but it is easy to see that the combustion of a coal-bed, or some other affair of equal insignificance, may have afforded all the foundation on which these reports ever rested. But though no traces of existing or of extinct volcanoes should be found in any part of the country affected by these earthquakes, it is not therefore necessary to go in search of some cause unlike those which in [186] other parts of the earth are believed to produce similar effects.

On the morning following the earthquake above mentioned, a fall of snow commenced, and continued during the day; towards evening it fell mixed with hail and rain, and covered the ground to the depth of about six inches.

The rain continued for some days, the mercury ranging from 40° to 48° and 50°, a temperature and state of weather as little grateful to an ague-shaken invalid as any weather can be. The snow which fell on the 10th remained on the ground until the 15th, when it had nearly disappeared, and a succession of bright days followed. The air was now filled with countless flocks of geese, sand-hill cranes, and other migratory birds on their passage to the south. The migrations of the ardea canadensis afford one of the most beautiful instances of animal motion we can

any where meet with. These birds fly at a great height, and never in a direct line, but wheeling in circles, they appear to float without effort on the surface of an aerial current, by whose eddies they are borne about in an endless series of revolutions. Though larger than a goose, they rise to so great an elevation as to appear like points, sometimes luminous, and sometimes opaque, as they happen to intercept or reflect the rays of the sun; but never so high but their shrill and incessant clamours may be heard.

While at Cape Girardeau we were induced, from motives of curiosity, to attend at the performance of some ceremonies by the negroes, over the grave of one of their friends, who had been buried a month since. They were assembled round the grave, where several hymns were sung. An exhortation was pronounced by one, who officiated as minister of the gospel, who also made a prayer for the welfare of the soul of the deceased. This ceremony, we are told, is common among the negroes in many parts of the [187] United States: the dead are buried privately, and with few marks of attention; a month afterwards the friends assemble at the grave, where they indulge their grief, and signify their sorrow for the deceased, by the performance of numerous religious rites.

On the 22d of November, having been informed the Ohio had risen several inches, Lieut. Swift determined to leave Cape Girardeau with the steam-boat on the following day. Dr. James had so far recovered as to be able to travel on horseback; and immediately set forward on the journey to the Falls of Ohio, intending to proceed by the nearest route across the interior of Illinois.

The immediate valley of the Mississippi, opposite the little village of Bainbridge, ten miles above Cape Girardeau, is four miles wide, and exclusive of the river, which washes the bluffs along the western side. Upwards, it expands into the broad fertile and anciently populous valley, called the American bottom; on the east, it is bounded by abrupt hills of a deep argillaceous loam, disclosing no rocks, and rather infertile, bearing forests of oak, sweet gum, tupelo, &c. The road crossing the hilly country between the Mississippi and the village of Golconda on the Ohio passes several precocious little towns, which appear, as is often the case in a recently settled country, to have outgrown their permanent resources. The lands, however, are not entirely worthless; and on some of the upper branches of the Cache, a river of the Ohio, we passed some fertile bottoms, though they are not entirely exempt from inundation at the periodical floods. The compact limestone about Golconda, near the sources of Grand Pierre creek, and near Covedown rock, contains beautiful crystals of Derbyshire spar; sulphuret of lead also occurs in that vicinity, as we have been informed, in veins accompanying the fluate of lime.[77]

On arriving at Golconda, Dr. James had become so much indisposed, by a recurrence of fever and [188] ague, as to be unable to proceed. This circumstance, with others, induced Lieut. Swift to leave the steam-boat, for the winter, at the mouth of Cumberland river. After a

[77] Golconda is the seat of Pope County, Illinois. Its origin as Lusk's Ferry, dates from 1800. Grand Pierre is a small creek which falls into the Ohio four miles above Golconda. On Cache River, see our volume xiv, note 51.— Ed.

delay of a few days, he continued his journey towards Philadelphia on horseback.[78]

Having thus traced the progress of the exploring party to their final separation, we shall add some discussions concerning the countries west of the Alleghany mountains, of a more general description than deemed compatible with the humble style of a diary, which we thought convenient to be retained in our narrative.

The following paper, from Major Long, comprises, moreover, the results of many observations made on various journies previous to those detailed in the foregoing account, and in parts of the country remote from those traversed by the expedition.

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[78] Most of the collections made on this expedition have arrived at Philadelphia, and are in good preservation; they comprise, among other things, more than sixty prepared skins of new or rare animals. Several thousand insects, seven or eight hundred of which are probably new; five hundred have already been ascertained to be so, and have been described. The herbarium contains between four and five hundred species of plants new to the Flora of the United States, and many of them supposed to be undescribed.

Many of the minerals collected by Mr. Jessup were left at Smithland, Kentucky. A suit of small specimens, adapted to the illustration of the geology of the country from the Alleghenies to the Rocky Mountains, has been received.

A collection of terrestrial and fluviatile shells was also made. Of these more than twenty new species have already been described and published. The organic reliquiæ collected on the voyage from Pittsburgh to St. Louis have not as yet been received in Philadelphia, but are daily expected.

The sketches, executed by Mr. Peale, amounted to one hundred and twenty-two. Of these, twenty-one only were finished; the residue being merely outlines of quadrupeds, birds, insects, &c.

The landscape-views, by Mr. Seymour, are one hundred and fifty in number; of these, sixty have been finished.— JAMES.

A GENERAL DESCRIPTION OF THE COUNTRY TRAVERSED BY THE EXPLORING EXPEDITION

Being the Copy of a Report of Major Long to the Hon. J. C. Calhoun, Secretary of War

Dated Philadelphia, Jan. 20. 1821.

Sir,

In obedience to your order of the 28th of November, I have the honour to submit the following report, embracing a concise account of the movements of the exploring expedition under my command, and a general description of the country explored by them. Although there may be no very striking incidents to embellish the narration, yet the diversity of scenery presented to the view, the changes in the character and aspect of the country, and the variety of other interesting matter in the several departments of natural science, which have been subjects of particular attention, cannot fail to awaken a lively interest in the minds of an enlightened community, inasmuch as a discussion of them must lead to a knowledge of the condition and natural resources of a large portion of the United States' territory. But as the principal object contemplated in this report is a general view of the topography of the country, the subjects of description will be such only as are thought to be illustrative of such a view.

[190] Movements of the Expedition

The expedition embarked on board of the United States' steam-boat, Western Engineer, at Pittsburg, on the 4th of May, 1819. Their outfit consisted of such books, instruments, stationery, &c. (a return of which is on file in the engineer department), together with such provisions, &c. as were deemed requisite at the commencement of their voyage. They proceeded down the Ohio river, making such observations and surveys along its banks as are calculated to augment the stock of intelligence already acquired in relation to that part of the country. This part of their route having been previously traversed by gentlemen of science, who have judiciously arranged and generously promulgated the intelligence they have collected, but little matter of a novel or interesting character could be expected. Yet an investigation of the numerous organic remains, and mineral productions, discoverable on the Ohio throughout its whole extent, together with such an examination of the country as is requisite to a general description of its aspect, soil, and vegetable productions, were considered as objects meriting their attention in the discharge of their several duties.

On arriving at the confluence of the Ohio and Mississippi, they proceeded up the latter to the Missouri, and thence up the river last mentioned to the Council Bluffs, improving every opportunity of extending their researches in the various branches of natural science. At the time of their arrival at the Council Bluffs, the season was so far spent, that it was deemed inexpedient to proceed further till the ensuing season; and the boat was accordingly dismantled, and moored in a safe harbour, and quarters

constructed for the accommodation of the party during the then approaching winter. Being located in a situation central to a variety of Indian tribes and nations, inhabiting the neighbouring country, [191] they were enabled to acquire a pretty extensive acquaintance with the manners, customs, and character of the natives in that quarter. Surveys of the surrounding country were made; observations for determining the latitude, longitude, magnetic variation, dip, &c. were taken; the changes of the weather, and other meteorologic phenomena were recorded; and such other duties performed, as pertained to the pursuits of the expedition.

On the voyage up the Missouri, a party was detached from the steam-boat at Fort Osage, with instructions to proceed across the country by land, to the Konzas village, and thence to the villages of the Pawnees, on the river Platte, and to return on board again at the Council Bluffs. This excursion was undertaken with a view of prosecuting the business of the expedition. The party had accomplished part of the duties assigned them, when they were met near the Konzas village by a war-party of the Republican Pawnees, and robbed of their horses, baggage, &c., which compelled them to give up the further prosecution of their enterprize. This misfortune rendered it necessary for them to change their route, and shape their course for the Missouri, which they reached at Cow Island, having obtained much useful information concerning the country through which they passed, and the natives inhabiting it.

On my return to the wintering post of the expedition, to which we had given the name of Engineer Cantonment, I pursued a course north of the Missouri, from near its mouth to that place, taking sketches of the country, pre-

paratory to a topographical delineation. The observance of courses, distances, magnetic variations, &c. were objects of our particular care and attention in all the movements of the expedition.

On my arrival at the cantonment, which I reached on the 27th of May last, preparations were made, with all convenient despatch, for reconnoitring the country [192] westward to the Rocky Mountains, in conformity to your order of the 28th of February, 1820. The steam-boat was ordered on topographical duties under the command of Lieut. Graham, who proceeded with her down the Missouri to St. Louis, thence up the Mississippi to the De Moyen rapids, and thence down the river to Cape Girardeau, taking such observations and sketches on the voyage as are requisite in constructing a chart of that part of the river and the adjacent country.

Having made the necessary arrangements, and rendered our outfit, for the western tour, as complete as circumstances would permit, we commenced our march on the 6th of June, all in good health, except Mr. Say, the zoologist for the expedition. It may not be improper here to give a list, exhibiting the names of the persons composing the party, and the several capacities in which they served.

S. H. Long, Major I. Engineers, commanding Expedition.

J. R. Bell, Capt. Lieut. Artillery, Journalist.

W. H. Swift, Lieut. Artillery, Assistant Topographer and Commanding Guard.

T. Say, Zoologist, &c.

E. James, Botanist, Mineralogist, and Surgeon.

T. R. Peale, Assistant Naturalist.

S. Seymour, Landscape-painter, &c.
Joseph Bijeau, Guide and Interpreter.
Abraam Ledoux, Farrier and Hunter.
Stephen Julien, Interpreter.
H. Dougherty, Hunter.
Zachariah Wilson, Baggage Master.
J. Duncan, J. Oakley, and D. Adams, Engagees.
John Sweney, Private of the Corps of Artillery.
Joseph Verplank, William Parish, Robert Foster, Mordecai Nowland, Peter Barnard, and Charles Myers, Privates of the Rifle Regiment, Pack-horsemen and Hunters.

[193] The number of horses and mules, provided for the use of the party, was thirty-four, including several that were the property of individuals; so that we were able to have all of the party mounted, and also a sufficient number of horses besides, for the transportation of baggage. In addition to arms, ammunition, a small quantity of provisions and other necessaries for the tour, our outfit embraced a small supply of Indian goods for presents, not exceeding £150 in value.

The instruments for astronomical and other observations, comprehended in our outfit, were very limited, both in number and variety. The mode of transporting them that we were compelled to adopt was by no means suited to the conveyance of delicate instruments, or such as required much space in packing. We, however, took all belonging to the expedition that were in good repair and of a portable construction. The principal were the following: one sextant of five inches radius; one snuff box sextant; one mercurial horizon with a glass frame; one patent lever watch of an excellent quality; three

travelling compasses; one measuring tape; two thermometers; and some few articles of apparatus for the use of the naturalists.

Every man being accoutred with a gun, shot-pouch, and powder-horn, and most of them with pistols, the exploring party proceeded westwardly to the Pawnee villages, situated on a branch of the Platte called the Loup Fork, thence southwardly to the Platte, and thence westwardly along the valley of the Platte, to the place where it issues from the Rocky Mountains. Having examined the mountains at that place, and finding the country too hilly and broken to penetrate with horses within their range, we shaped our course southwardly along their base, taking occasion to ascend the peaks and spurs of the mountains whenever a favourable opportunity presented, for the purpose of ascertaining their geological character, and that of the vegetables growing upon them.

[194] On arriving at the Arkansa Captain Bell was detached with a small party to ascend along the river as far as it was practicable to travel with horses, and was able to ascend nearly thirty miles, when his further progress was intercepted by the proximity of the hills to the river.

Having descended the Arkansa about one hundred miles to the point whence it was judged expedient to strike upon a southwardly course in quest of the source of the Red river, the party was formed into two detachments; the one to proceed down the Arkansa, under the direction of Captain Bell, and the other to accompany me, with the view of exploring the country southwardly to Red river, and thence down its valley to the upper settlements thereon. .

Captain Bell's party, with the exception of three soldiers last mentioned in the foregoing list, who deserted on the march, arrived in safety at Belle Point, their place of destination, having performed the duties assigned them.

On separating from Captain Bell, the detachment under my direction proceeded southwardly in view of the mountains about one hundred and fifty miles, and arrived at a creek, having a southwardly course, which we took to be tributary to Red river. Having travelled down its valley about two hundred miles, we fell in with a party of Indians of the nation of Kaskaias, or Bad-hearts, who gave us to understand that the stream along which we were travelling was Red river. We accordingly continued our march down the river several hundred miles further; when, to our no small disappointment, we discovered that it was the Canadian of the Arkansa, instead of Red river, that we had been exploring. Our horses being nearly worn out with the fatigue of our long journey, which they had to perform bare-footed, and the season being too far advanced to admit of retracing our steps and going again in quest of the source of Red river with the possibility of exploring it before the commencement [195] of winter, it was deemed advisable to give over the enterprise for the present, and make our way to the settlements on the Arkansa. We were led to the commission of this mistake in consequence of our not having been able to procure a guide acquainted with this part of the country. Our only dependence, in this respect, was upon Pike's map, which assigns to the head-waters of the Red river the apparent locality of those of the Canadian. We continued our march, therefore, and arrived at Belle Point

on the Arkansa on the 13th September, four days after the arrival of Captain Bell and his party.

Both parties suffered occasionally for the want of food and water; but in general the game of the country yielded us an ample supply of the former, and the watercourses, along which we for the most part travelled, satisfied our demands for the latter. In regard to health we were all highly favoured, except Mr. Say, who was more or less indisposed throughout the tour. Some of the rest were occasionally affected with slight indisposition.

It is a source of much regret that we had the misfortune to lose some of our most valuable manuscripts by the desertion of three soldiers of Captain Bell's party before mentioned. They deserted on the head-waters of the Verdigrise river, within about two hundred miles of the upper settlements of the Arkansa, taking with them three horses, the best belonging to the party, four saddle-bags, containing wearing apparel and other things belonging to the gentlemen of the party, besides the following manuscripts: viz. Journal of the Tour, one number; Manners and Customs of the Indians, one number; Zoological Description and Remarks, one number; Vocabularies of Indian Languages, two numbers; all by Mr. Say; and one number, containing Topographical Notes and Sketches, by Lieutenant Swift. In addition to the above, the loss of a few horses that died [196] on the march was the only accident or misfortune worthy of notice that befel the expedition.

From Belle Point the exploring party proceeded across the country in a north-eastwardly direction to Cape Girardeau, where they arrived on the 10th October,

having been occupied a little more than four months in the performance of the tour from the Council Bluff.

Throughout the whole excursion the attention of the gentlemen of the expedition was constantly occupied upon the several subjects of investigation which were deemed essential to a topographical and scientific description of the country. In the discharge of our duties, however, we laboured under many disadvantages for want of a sufficient variety of instruments to furnish all the data proper and desirable in giving an account of the geology and meteorology of the country. A barometer would have been particularly useful; but out of three belonging to the expedition two were rendered completely unfit for use, partly by accident and partly by defects in their construction, and the third was in such a condition that it was not deemed advisable to take it with us, as it was not likely to remain fit for service but for a short time only. In ascertaining the humidity of the atmosphere a hygrometer would have been particularly useful, but it has never been in my power to procure one that had any claim to being accurate. In taking the various observations, however, that could be effected by means of the few instruments we had with us, no pains were spared, and no opportunities lost; those in particular, for the calculation of latitude and longitude, were taken as often as it was thought necessary, and with the utmost care and precision that circumstances would permit.

On our arrival at Cape Girardeau we had contemplated to embark on board of the Western Engineer, which was at that port ready for our accommodation, [197] and sail for Louisville; but, learning that the water of the Ohio was at that time too low to admit even the passage of a boat

drawing no more than fifteen or sixteen inches of water, we were compelled to seek another mode of conveyance. Those of the expedition who had been on duty during the two last seasons, being very anxious to visit their homes, arrangements were accordingly made for their return to Philadelphia, when they would be enabled to complete and report the intelligence they had collected. Messrs. Say, Peale, Seymour, and Lieut. Graham, being desirous to return by water, waited the opportunity of taking a passage to New Orleans, and thence to Philadelphia. Most of the curiosities collected by the expedition were placed in the charge of Mr. Say, to be shipped for this place.

Lieut. Swift was left in command of the steam-boat and crew, with instructions to proceed with them to Louisville as soon as the water would permit. He was instructed to leave the boat in the care of the pilot employed on board of her,— order her crew of United States' soldiers to Newport, Kentucky, for winter quarters and subsistence, and report in person at Philadelphia, for topographical duty.

GENERAL DESCRIPTION OF THE COUNTRY TRAVERSED BY THE EXPLORING EXPEDITION

Having given the foregoing brief account of the movements of the expedition, we next proceed to a consideration of the region explored by them, which embraces a very considerable portion of the immense valley situated between the Alleghany and Rocky Mountains. The portion of this valley to which their attention has been more particularly directed, and relative to which intelligence has been collected, is situated between thirty-five

and forty-two degrees of north latitude, and eighty and one hundred and six degrees of west longitude, embracing an extent of [198] about five hundred miles in width from north to south, and thirteen hundred miles in length from east to west. As might be expected in a region of this extent, a great diversity of surface is presented to view, exhibiting all the varieties, from the most level and unbroken to the most rugged and mountainous aspect. The most broken parts of this region are those situated along the Ohio, from its source to its confluence with the Mississippi, and on the west of the Mississippi, between Red river and the Arkansa, and between the latter and the Missouri, extending westward about four hundred miles from the Mississippi. The whole region, in a geological point of view, is constituted of three varieties of formations, which characterize the surface throughout; viz. transition, secondary, and alluvial. A tract, however, of considerable extent, including the hot springs of the Washita, and extending northwardly to the lead mines back of St. Genevieve, has, by some, been considered as possessing a primitive character; but it is believed that the rocks discoverable therein are not sufficiently uniform to warrant such a decision. Moreover, an insulated tract of primitive country, surrounded by others exhibiting the most unequivocal marks of their being secondary, and at the same time presenting a similar conformation in their general aspect, is such an anomaly in natural science as requires more than ordinary proof to be admitted. The particular tract under consideration is probably analogous to other tracts within the region above specified, exhibiting a surface character-

ized by primitive formation superincumbent upon others of a secondary character.

In order to give a more distinct conception of the country or region under consideration, it may be regarded as divisible into the following sections: viz. 1st, the country situated between the Ohio river and the Alleghany mountains; 2d, the country situated between the Ohio, Mississippi, and the Lakes; [199] 3d, the country situated between the Mississippi and Missouri rivers; 4th, the country situated between the Red and Missouri rivers, west of the Mississippi and east of the meridian of the Council Bluff; and 5th, the country between the proposed meridian and the Rocky Mountains.

Of the country situated between the Ohio river and the Alleghany mountains

The country on the south side of the Ohio, including the northerly parts of Pennsylvania, Virginia, and Tennessee, together with the whole of Kentucky, abounds in hills elevated, in the vicinity of the Ohio, from four to eight hundred or a thousand feet above the water-table of the river, and rising many hundred feet higher in the neighbourhood of the Alleghany mountains. This section is watered by many streams of considerable magnitude tributary to the Ohio, the most important of which are the Monongahela, Kenhawa, Great Sandy, Licking, Kentucky, Salt, Green, Cumberland, and Tennessee. These rivers are all navigable for keel-boats, and many of them for steam-boats, some hundreds of miles, during the boating season, which generally commences about the 20th February and terminates early in June.

Occasional freshets contribute to render them navigable during short portions of the other months of the year; but no reliance can be placed in periodical returns of freshets, excepting those of the spring season. Upon these rivers are extensive and valuable tracts of bottom land covered with deep and heavy forests, and possessed of a soil adapted to the cultivation of all the variety of vegetable products common to the various climates in which they are situated. The highlands, back of the bottoms, although variegated with hills and vallies alternating with each other in quick succession, are generally possessed of a surface susceptible of being tilled, and in many instances of a soil equally rich and prolific with that of the bottoms. [200] In many parts of the country, however, the hills are abrupt and stony to such a degree as renders them unfit for tillage. The average produce per acre, upon the farming lands of this section, may be estimated at the following rates: viz. Indian corn or maize, forty bushels; wheat, twenty-two; rye, twenty-six; oats, thirty-five; barley, thirty; tobacco, from twelve to fifteen cwt., and cotton from five to seven cwt. In regard to the products last mentioned, viz. cotton and tobacco, it should be observed, that they are cultivated only in the south-westerly parts of this section, and that oats and barley are seldom cultivated except in the upper or north-easterly parts.

Of the population of this section, if we except the towns and villages and their immediate vicinities, as also a large portion of country surrounding Lexington, Kentucky, and another of considerable extent, including Nashville, Tennessee, it is yet but thinly inhabited, affording room for a population far more numerous and more widely

diffused. There are extensive tracts of country between the Alleghany mountains and the Ohio as yet almost entirely destitute of inhabitants, the most considerable of which are situated in the vicinity of the mountains, also the country generally between Tennessee river and the Mississippi. As this section of country is pretty generally well known, the foregoing outline of its topography will suffice.

Of the country situated between the Ohio, Mississippi, and the Lakes

The section of country next in the order proposed is situated north of the Ohio river, and comprehends the states of Ohio, Indiana, and Illinois. This section may be subdivided into three orders or varieties of country, which merit a separate consideration, viz. the hilly, the plain or rolling, and the valley country.

[201] The hilly country, like that south of the Ohio, exhibits a very uneven surface, variegated with hills and dales irregularly distributed, and occupying about one third part of the section under consideration. This portion of the country is of an oblong shape, bounded on the south-east by the Ohio river, and on the north-west by an imaginary line, commencing on the Mississippi near the grand tower, and running in a direction nearly E. N. E., till it approaches the easterly part of Lake Erie. On the east it mingles with the hilly country, comprehending the back parts of Pennsylvania and New York. In short, the whole region situated between the Alleghany mountains and the imaginary line above specified, or in other words, the country through which the Ohio and its tributaries, except the Wabash, have their courses, may

be arranged under this head. The hills throughout the whole are very similar in respect to their altitudes, multiplicity and conformation.

Although the hilly country north of the Ohio is in many places rugged and broken, yet a large proportion of it is susceptible of cultivation. No high mountains are to be seen; the hills usually rise from six to eight hundred feet above the common level, or about one thousand feet above the water-tables of the principal rivers, and invariably present rounded summits. Interspersed among the hills are numerous fine tracts of arable land, which may in general be alleged of the valleys of the numerous rivers and creeks by which the country is watered. The soil upon the hills is generally productive, except where the surface is rocky and the declivities abrupt, which is more particularly the case in the vicinity of rivers, where the high lands are divided into numerous knobs, being cut by deep ravines with abrupt and precipitous banks.

The hilly country, having been generally esteemed more healthy than either of the other varieties above mentioned, has acquired a more numerous population [202] than the latter. As yet, however, no part of this section has its full complement of inhabitants, if we except, as before, the numerous towns and villages and their immediate neighbourhoods. In regard to the products of agriculture, the same remarks that have been made concerning the section south of the Ohio are equally applicable to the country under consideration, with the exception that cotton is cultivated only in the south-westerly extreme of this section, and tobacco is raised for domestic uses only.

The most considerable rivers intersecting this section of country are the Muskingum, Sciota, Big Miami, and Wabash, all of which, in the spring season, are navigable two or three hundred miles from their mouths.

The valleys of these rivers give place to many extensive and fertile bottoms well adapted to cultivation, and producing the necessaries of life in great abundance and variety.

The plain, or rolling country, is separated from that last under consideration by the imaginary line above mentioned. It is not to be inferred, however, that the junction of these two regions is distinctly marked by any characters whatever by which the line can be traced with precision, but that a gradual change of aspect is observable in travelling from one variety of country to the other, and that the general direction of the line indicated by this change is that specified above. The other boundaries of this variety are the Mississippi on the west, and the Lakes Erie and Michigan, and the Fox and Wisconsan rivers on the north and east. This variety of country, although not entirely destitute of hills, is almost throughout its whole extent possessed of an undulating or rolling surface, rising into broad and gentle swells in some parts, and subsiding into extensive flats or plains in others. The valleys of numberless watercourses, bounded by abrupt bluffs or banks, afford some diversity to its aspect; and the bluffs in [203] particular of the principal streams, being cut by numerous ravines, contribute in many places to give the surface a hilly and broken appearance. Although no part of this region can with propriety be denominated hilly, especially when compared with the portions of country above considered, yet upon the

Wisconsan, Fox, the headwaters of Rock and Melwakee rivers, the country is considerably diversified with hills, or rather swells, and valleys. The only hills worthy of particular notice, not only in this variety, but in the whole section under consideration, are the Ocooch and Smokey mountains, which are broad and elevated ridges rather than mountains. The former is situated about twelve miles north of the Wisconsan, one hundred miles above its mouth, and the latter about forty miles south of the portage between the river just mentioned and Fox river of Green Bay. The rivers of most note within this region are, the Wabash, above the hilly country before described, the Kaskaskias, Illinois, Rock and Wisconsan, tributary to the Mississippi; the Fox of Green Bay, the St. Joseph of Lake Michigan, and the Maumee and Sandusky, tributary to Lake Erie. These rivers are all navigable for boats of ten or fifteen tons burden when swollen by spring freshets; but, during the greater part of the summer and fall, they have not a sufficient depth of water for boats of burden, and in winter their navigation is entirely obstructed by ice. The spring freshets, consequent to the melting of the snow and ice, usually take place in the month of March, the southerly streams being open for navigation much earlier than those in the north.

The prairies, or champaigns, east of the Mississippi, are mostly situated in this particular region, occupying at least three fourths of it. These are waving or flat tracts of country, of greater or less extent, separated from each other by narrow skirts of woodland situated upon the margins of rivers and creeks. They are generally possessed of a rich soil, yielding [204] a spontaneous growth of grass and herbage of a luxuriant appearance. They

are well adapted to the cultivation of corn, wheat, rye, barley, oats, &c. of which they yield plentiful crops.

The prevailing opinion in regard to this portion of the country, viz. that it is unhealthy, appears too well founded to admit of refutation. The causes that contribute to render it so are very obvious: a large proportion of the prairies are so flat that much of the water deposited upon them by showers remains stagnant upon the surface till it is carried off gradually by evaporation, which renders the atmosphere humid and unhealthy. The vegetable mould of which the immediate surface is composed, and the abundance of vegetables that spring and decay upon the ground, contribute largely to render these exhalations more deleterious. Although there are but few swamps or marshes, and very rarely pools of stagnant water, to be met with in this region, still the general water-table of the country is so little inclined, that the streams, having but a moderate descent, are uniformly sluggish, often exhibiting the appearance of a succession of stagnant pools. The consequence is, that the vegetable matter they contain, instead of being carried away by the strength of the current, is deposited upon the bottoms and sides of the channels, and, while in its putrescent state, serves to augment the quantity of noxious effluvia with which the atmosphere is charged.

The population of this region, compared with its extent, is very limited; and with the exception of a few villages the settlements are very scattering. Large portions of it, embracing the northerly parts of Indiana and Illinois, are almost entirely destitute of inhabitants. Many parts of the country must remain uninhabited for many years to come, on account of the scarcity of timber and other

deficiencies, such as the want of mill-seats, springs of water, &c. which are serious blemishes in the character of a large [205] proportion of the country. There are, however, numerous and extensive tracts within this region possessed of a rich soil, and in other respects well adapted for settlements, and presenting the strongest inducements for emigrants to occupy them.

The country of the third order, agreeably to the subdivision above given, viz. the valley country, is situated upon the rivers, and is included within the hilly and plain country above described. The tracts belonging to this order, usually denominated bottoms, are altogether alluvial, being composed of alternate layers of sand and soil deposited from the water of the rivers upon which they are respectively situated. The alluvion thus deposited, having once constituted a part of the surface of the countries drained by the watercourses tributary to the rivers along which the deposit has been made, it will readily be inferred that the fecundity of the valleys will in some measure correspond with that of the countries whence their alluvion was derived. Accordingly we find the bottoms more or less productive in proportion to the fertility of the regions in which the rivers take their rise and through which they flow. In the valley of the Ohio the quality of the soil appears to improve from its source downwards. The alluvion, of which it is composed is supplied by the Alleghany and Monongahela rivers, which have their origin and courses in a hilly and mountainous country, possessed in general of a sandy surface. The alluvion, supplied by other tributaries entering the Ohio at various points between its source and its mouth, is of a better quality, being composed principally of argilla-

ceous and calcareous earth, which are prevailing ingredients in the soil of the country drained by those tributaries.

It should be remarked, however, in relation to all the varieties of alluvia, that they are partially composed of the fine particles of decayed vegetable [206] matter with which the water drained from the surface of the ground is invariably charged. This property in alluvial deposits often prevails to such a degree as to render soils, apparently sandy and steril, remarkably productive. The alluvial bottoms throughout the United States afford innumerable examples of this fact. The fertilizing matter often exhibits itself in the slimy deposits left upon the surface of the ground after an inundation.

The most extensive tract of valley country east of the Mississippi is that situated within the bluffs of this river, usually denominated the American Bottom, extending from the mouth of the Ocoa, or Kaskaskias river, northwardly to that of the Missouri. This spacious bottom, although at present elevated much above the range of the highest freshets, is nevertheless alluvial. Its length along the Mississippi is about eighty, and its average breadth about four miles. It is generally destitute of a timber growth, except along the margin of the river, upon which there is a skirt of woodland extending almost from one end of the tract to the other. The alluvion of the American Bottom is composed of the rich mud brought down by the turbid Missouri, united with an abundance of vegetable matter yielded by the waters of the upper Mississippi, which also characterizes the bottoms of this extensive river from the Missouri downward to its mouth. Upon this bottom are situated the town of Kaskaskias, the villages of Prairie de Rocher, Harrison,

Prairie de Pont, Cahokia and Illinois, together with many other settlements.

On the same side of the river another large tract of valley land, called the Mississippi Bottom, commences a few miles below the mouth of the river Kaskaskias, and extends downwards along the Mississippi, between fifty and sixty miles, having an average width of about three miles. This tract, in regard [207] to soil and aspect, is of a character similar to that of the American Bottom, except that the former is more plentifully stocked with timber.

Besides these, there are numerous other bottoms on the Mississippi, within the limits prescribed for this report, all of which are composed of a rich alluvion. Those in particular situated below the confluence of the Mississippi and Missouri are possessed of a soil exceedingly luxuriant, being composed, as before observed, of the rich and fertilizing mud deposited from the water of the Missouri. Most of them are covered with deep and heavy forests of timber, accompanied with a luxuriant undergrowth of vines, shrubs, grass and other herbage.

The bottoms of the Wabash, Kaskaskias, Illinois, and Rock rivers, are also made up of a rich alluvion of sand and loam, containing a large proportion of vegetable mould. Their surfaces, like those of the Mississippi bottoms, are generally flat, exhibiting tabular elevations or benches, formed by the washing of their rivers at different periods. Large tracts of prairie land are to be met with upon them; but for the most part the proportion of woodland is amply sufficient to supply the adjacent country with timber and fuel.

The valleys of these rivers differ from that of the Ohio,

not only in having a greater width, but also in being limited on both sides by bluffs stretching along their whole length, and maintaining nearly a parallel direction; whereas the valley of the Ohio is bounded by abrupt hills irregularly disposed, in some instances protruding far into the valley like promontories, and in others retiring from the river, and affording room for bottoms of pretty large extent. The Ohio bottoms are uniformly clad in deep forests, except where they have been removed by settlers; no prairies worthy of notice making their appearance.

[208] The valley country, from the circumstances already detailed in allusion to the country constituting the second variety, is almost without exception unhealthy. But at the same time it appears evident, that this evil gradually decreases in proportion to the increase of population, and the consequent advancement of agriculture; for the products of the soil, which the bottoms yield in the greatest profusion, instead of being left to wither and decay upon the surface, are necessarily consumed in the subsistence of man and beast; in consequence of which, one of the most fruitful causes of pestilential effluvia, viz. vegetable putrefaction, is in a very considerable degree removed.

The prevailing timber growth of the region comprehending the two sections of country already described, is exhibited in the following list of trees: viz. cotton-wood, willow, sycamore, black walnut, pecan, coffee-tree, sweet and sour or black gum, red and water elm, hackberry, blue and white ash, linden, yellow and white poplar, catalpa, black and honey locust, buck-eye, bur oak, white and black oak, mulberry, box, elder, white dogwood, sugar-tree, white maple, wild cherry, red oak, hickory,

iron-wood, and hop hornbeam. The foregoing constitute the principal timber growth of the valley country, and are to be met with more or less frequently throughout the whole of it. Red beech is abundant in some parts of the valley of the Ohio, and in those of many of its tributaries; it abounds also in the northerly parts of the States of Ohio and Indiana. Post oak, black jack, and several other varieties of the oak, also chesnut, white and shell bark, hickory, persimmon, &c. are sometimes found in the bottoms, but are more prevalent upon the hills and highlands. Pitch pine abounds in many parts of Ohio and Indiana, and generally in the neighbourhood of the Alleghany mountains. White pine occasionally [209] makes its appearance in the northerly parts of Ohio. Red cedar is found in a great variety of places throughout the country, but no where in great abundance.

The under-growth of the several tracts of country above considered includes a great variety of shrubs, vines, brambles, grass and other herbage, to be enumerated in a botanical catalogue daily expected from Dr. James.

The most valuable timber trees are the white, post, and bur oaks, the white and blue ash, the shell bark hickory, the black walnut, the cherry, the locust, chesnut, poplar, mulberry, beach, cotton-wood and linden. The two last mentioned are seldom used where other kinds of timber are to be had. The cotton-wood is not only the most abundant timber-growth upon the bottoms, but is more widely diffused than any other, and in many places is the only variety of forest trees that make their appearance; which, however, is more particularly the case westward of the Mississippi.

Of the country situated between the Mississippi and Missouri rivers

We next proceed to a consideration of the country west of the Mississippi, and shall begin with that situated between this river and the Missouri. This section contains no mountains, or indeed hills, of any considerable magnitude. The term *rolling* appears to be peculiarly applicable in conveying an idea of the surface of this region, although it is not entirely destitute of abrupt hills and precipices. The aspect of the whole is variegated with the broad valleys of rivers and creeks, and intervening tracts of undulating upland, united to the valleys by gentle slopes. Its surface is chequered with stripes of woodland situated upon the margins of the watercourses, and dividing the whole into extensive parterres. If we [210] except those parts of the section that are contiguous to the Mississippi and Missouri, at least nineteen-twentieths of the country are completely destitute of a timber-growth.

Within the valleys of these two rivers are extensive tracts of alluvial bottom possessed of a rich soil. The bottoms of the Missouri in particular are probably inferior to none within the limits of the United States in point of fertility. Those of the Mississippi are very rich, but do not exhibit symptoms of so great fecundity as the former. The bottoms of both, on ascending the rivers, become more sandy, and apparently less productive.

The bottoms of the Missouri are for the most part clad in a deep and heavy growth of timber and under-brush, to the distance of about three hundred and fifty miles

above its mouth. There are, however, prairies of considerable extent occasionally to be met with on this part of the river. Higher up, the prairies within the river valley become more numerous and extensive, till at length no woodlands appear, except tracts of small size, situated at the points formed by the meanders of the river.

The bottoms on the Upper Mississippi (that part of the Mississippi situated above its confluence with the Missouri being distinguished by this appellation) contain less woodland, in proportion to their extent, than those of the Missouri. The prairies upon this river also become more numerous and extensive as we proceed upward.

The interior of the country, situated between the valleys of these rivers, presents, as before remarked, a rolling aspect, inclining to hilly, and broken in some parts, but generally variegated with gentle swells and broad valleys. Within this section are numerous small rivers and creeks, with valleys of a character similar to those of the Mississippi or Missouri, but not so fertile. These valleys expand to a great width, compared with the magnitude of the streams upon which they are situated, [211] but are not bounded by abrupt bluffs, like those of the two rivers just mentioned. They are generally covered with a luxuriant growth of grass and other herbage, and occasionally present copses of woodland of moderate extent. The timber-growth of the bottoms is similar to that of the Mississippi bottoms; cotton-wood, blue and white ash, hackberry, black walnut, cherry, mulberry, hickory, and several varieties of the oak, being the prevailing timber trees. The hills or high lands are in some instances covered with a scrubby growth of timber and furze, con-

sisting of post oak, black jack, hazel, green brier, &c. The soil of this section is probably equal, if not superior, to that of any other tract of upland of equal extent within our territory. But the scarcity of timber, mill-seats, and springs of water,— defects that are almost uniformly prevalent,— must for a long time prove serious impediments in the way of settling the country.

The population of this section of country is located almost exclusively within the valleys of the Mississippi and Missouri, and in their immediate neighbourhood, extending upwards along the former about one hundred and sixty, and along the latter about three hundred and twenty miles above their confluence. The most populous parts of the country are the county of St. Charles, situated near the junction of these two rivers; Cote Sans Dessein and its vicinity; that part usually denominated the Boon's Lick country, extending from the mouth of Osage river upward along the Miami to the river Charaton; and the country on the Mississippi, including the Salt river settlements, which have become numerous and pretty widely diffused.

Along the valleys, both of the Mississippi and Missouri, there are still innumerable vacancies for settlement, holding forth inducements for emigrants to occupy them, equally as strong as any of the positions already occupied. The inhabitants of this [212] section have frequently been visited by the prevailing epidemics of the western country, which may be attributed, in all probability, to the same causes that have been herein assigned in relation to the country east of the Mississippi, which operate with equal force and effect upon the inhabitants of this section.

Of the country situated between the Missouri and Red rivers, west of the Mississippi and east of the meridian of the Council Bluff.

Although no precise limits can be assigned as the western boundary of this section, yet the meridian above proposed may be regarded as a line of division between two regions differing in their general character and aspect. It is not pretended that the immediate course of the line is marked by any distinct features of the country, but that a gradual change is observable in the general aspect of the two regions, which takes place in the vicinity of the proposed line. The assumed meridian is in longitude ninety-six degrees west nearly, and crosses the Platte a few miles above its mouth, the Konzas near the junction of the principal forks, the Arkansa about one hundred miles above the Verdigrise, or seven hundred miles from its mouth, the Canadian about one hundred and fifty miles from its mouth, and the Red river about one hundred and fifty miles above the Kiamesha river.

The section of country under consideration exhibits a great variety of aspect, the surface being diversified by mountains, hills, valleys, and occasional tracts of rolling country; within the section, is an extensive tract of bottom land deserving of a particular consideration. It is situated on the Mississippi, commencing a few miles below the Ohio, and extending downward to Red river, uninterrupted by hills or high lands, and subject in many places to inundation from the freshets of the Mississippi. The bottoms contain many large swamps, rendered almost [213] impenetrable by a dense growth of cypress and cypress-knees (the latter of which are conical excrescences

springing from the roots of the cypress, and shooting up in profusion to the height of from one to eight or ten feet). The most extensive of these swamps commences near the head of the bottom, and passes south-westwardly back of New Madrid, the Little Prairie, St. Francisville, &c., and terminates near the village of the Port of Arkansa. The Great Swamp, the name by which this extensive morass is designated, is about two hundred miles in length, and is of a variable width, from five to twenty or thirty miles. The timber-growth of this and of the other swamps, which are of a similar character, but inferior in magnitude, consist principally of cypress of a superior quality. But the difficulty of removing it renders it of little value to the country. Within the bottom are also numerous lakes, lagoons, and marshes, once, no doubt, parts of the bed of the Mississippi, or of some of its tributaries that have their courses through the bottom. Notwithstanding the general depression of this bottom, it contains many insulated tracts of considerable extent, elevated above the range of the highest floods. The bottom, almost throughout its whole extent, supports a dense and heavy growth of timber, of an excellent quality, together with a luxuriant under-growth of cane brake, vines, &c.

It may not be improper to remark in this place, that great havoc is annually made amongst the timber of this tract, by lumber and fuel mongers, who furnish the New Orleans market with large supplies of these articles, particularly of the former.

The bottom is bounded on the west by a chain of heights, corresponding to the river bluffs on other parts of the Mississippi, but not arranged in so regular a man-

ner. These are the commencement of a part of the hilly country hereafter to be considered. The most considerable rivers that flow through the bottoms, and pour their tribute into the Mississippi, [214] are the St. Francis, the Big Black and White rivers, which are confluent, the Washita and Red river.

There are also a few other bottoms on the west side of the Mississippi of moderate size. The largest of these are Tywapata and Bois Broulè, situated a little above the mouth of the Ohio.

The hilly and mountainous country commences immediately west of the Mississippi bottoms, and extends westwardly about four hundred miles. Although the terms *hilly* and *mountainous* are expressive of the general character of the country, yet the following portions of this section may be enumerated as exceptions, viz. a tract of country comprehending St. Louis, Belle Fontain, Florissant, and extending south-westwardly so as to include the lead mine tract, Belle View, &c. This tract (which embraces the most populous part of the Missouri territory) may be denominated rolling, or moderately hilly. Considerable portions of the country situated between the Arkansa and Red rivers, particularly in the vicinity of the latter, are also of this character. On the Arkansa, above Belle Point, is an extensive tract of a similar description; as also many tracts of inferior size, on the north side of the Arkansa, between the villages of the Port and the Cadron settlements. On the south side of the Missouri is also an extensive tract of rolling country, commencing at the river Le Mine, six miles above Franklin, and extending upward along the Missouri, with occasional interruptions, to the Council Bluff. Such is the extent of this

tract, that it comprises almost the whole of the country situated between the assumed meridian line and the Missouri, from Fort Osage upward. On the head waters of the Osage river, and on those of its principal tributaries, the country is said to be of a similar character also. To these may be added large portions of country situated on the Verdigrise river, upon the Arkansa, above Grand river, and upon the [215] Canadian, from its mouth upwards to the distance of about two hundred miles. The tracts here designated, exhibit broad and elevated swells of land, separated from each other by deep and spacious valleys.

These portions of country are chequered with woodlands and prairies, in many instances alternating with each other in due proportion, for the accommodation of settlers with farming and woodlands. On the Missouri above Fort Osage, and on the Osage river, however, the proportion of woodland is very inconsiderable, and the timber it affords of a scrubby character. The prairies here, as on the north of the Missouri, occupy at least nineteen-twentieths of the whole surface. Some portions of the Red river country are also deficient in the quantum of woodlands allotted to them; but in general it may be observed, that the more southerly regions are better supplied with timber than those farther north. The growth of the woodlands interspersed amongst the prairies is mostly post oak, hickory, black jack, and white oak upon the high lands; and cotton-wood, sycamore, black and white walnut, maple, bur oak, and several other trees common to the western bottoms, in the valleys. The bow wood, or, as it is sometimes called, the Osage orange, is found upon the southerly tributaries of the Arkansa,

and upon the Red river and its tributaries. This tree is deserving of particular notice, inasmuch as it affords a timber extremely compact and elastic; its trunk and roots may prove very useful in dying yellow, and its fruit of importance in medicine.

The residue of this section, with the exception of the river bottoms, and tracts of valley land scattered in various directions throughout the whole, is extremely hilly, broken, and mountainous, the hills and mountains rising from five to fifteen hundred feet above the water-table of the country in which they are situated. They are exceedingly numerous, and are divided into a multiplicity of knobs and peaks, [216] having rounded summits, and presenting perpendicular cliffs and abrupt precipices of sandstone. Their surfaces generally are covered with rocks of this description, or flinty fragments strewed in profusion upon them. The growth upon them is, almost exclusively, pitch pine, cedar, scrubby oaks, hickory, haw and bramble; the poverty of the soil in some instances, and the scarcity of it in others, excluding the more luxuriant vegetable productions common to the more level country in their vicinity.

The range of mountains situated between the Arkansa and Red rivers gives rise to the following streams, all of which are sufficiently copious for mill-seats, and abound in cascades and falls, well adapted to such purposes; viz. the Blue Water, Kiamesha and Little rivers; the Mountain, Rolling, Cossetot and Saline forks of Little river, all of which are tributary to Red river; the Little Missouri, Cadeau, Washita, and the Saline, all confluent; the Mamelle, Le Fevre, Petit Jean and Poteau, tributary to the Arkansa, besides numerous creeks of less note.

The hills and mountains between the Arkansa and Missouri are equally prolific in watercourses. The most considerable of these are the Verdigrise, Neosho or Grand river, Illinois; together with the Frogs, Mulberry, White Oak, Spadra, Pine, Illinois, Point Remove and Cadron creeks, tributary to the Arkansa; the Little Red and White rivers, confluent streams; the Strawberry, Spring, Eleven Point, Currant, Little and Big Black, all confluent, and tributary to White river, which enters the Mississippi about thirty miles above the mouth of the Arkansa. The St. Francis and the Merameg have their sources in this broken region also, and discharge themselves into the Mississippi. Of the valleys of the rivers last enumerated, viz. those north of the Arkansa and tributary to the Mississippi, it is observable that they are uniformly possessed of a rich soil, but owing to the excessive floods occasionally brought down through them from [217] the hills and mountains, their cultivation is very precarious. The valley of White river, and those of some few others, are in many places elevated above the reach of the highest freshets, and are not altogether subject to this inconvenience. But for the most part they are liable to being swept by overwhelming freshets, which prostrate fences, buildings, and every artificial structure that opposes their march. Even a fall freshet has been known to inundate plantations situated within the valleys, to the depth of eight or ten feet. These floods are generally very sudden, as well as excessive, to such a degree, that on some occasions the water has risen, in the course of one night, more than twenty feet. By these sudden rises of the water, the planter that in the evening thought his family and possessions secure from harm, has been compelled the next

morning to embark with his family in a canoe, to save themselves from impending destruction, while his habitation, fields, cattle, and all his effects, are abandoned to the fury of the torrent.

The streams rising in the same hilly country, and tributary to the Missouri, are the following, viz. the Bon Homme creek, the Gasconade, the Osage and its tributaries, the Le Mine, the Blue Water, and several streams tributary to the Konzas river. Upon some of these, as the Bon Homme, Gasconade, and some few creeks besides, mills have been constructed, at which much of the timber of the St. Louis market is sawed.

This section, as yet, is but very partially populated, although the inhabitants in some portions of it are considerably numerous. The most populous part of the section is the country situated immediately below the mouth of the Missouri, including the town of St. Louis and the villages of Florissant and Carondelet, Herculaneum, St. Genevieve, Bainbridge, Cape Girardeau, Jackson, St. Michael's, and the country in their vicinity; the lead mine tract, including Mima [218] Berton, Potosi, and Belle View, are considerably populous. The settlements in these places, however, if we except the scites occupied by the towns and villages just enumerated, are still very scattering, and but a small proportion of the land susceptible of agriculture is yet under cultivation. Besides these, there are numerous other settlements and several small villages within this part of the Missouri territory, distributed in various directions, and constituting but a very scanty population. They are scattered along the Missouri from its mouth to Fort Osage, a distance of more than

three hundred miles, on the Gasconade, Merameg, St. Francis, Big Black, and several of its tributaries.

Within the Arkansa territory, there are but few villages, and the settlements are as yet very scattering. The principal villages are the Port of Arkansa, situated about sixty miles above the mouth of the river; Davidsonville, on Big Black river; a small village at the commencement of the high lands on the Arkansa, at a place called the Little Rock, about two hundred miles from the mouth of the river, selected as the seat of government for the territory. Besides these, there are a few other inconsiderable villages on the Arkansa river, as also several of small size, situated in the country between the river just mentioned and the Red river, the most considerable of which are at Pecan Point, Mount Prairie, Prairie de Inde, &c. These villages contain but very few houses, and those generally of a rude structure, a circumstance attributable only to the infancy of the territory. The settlements of the territory are scattered along the Arkansa, from the White river cut off (a channel uniting these two rivers at the distance of thirty miles above the mouth of the former, and three miles above that of the latter) to Belle Point, a distance of about four hundred miles. On Little Red, White, and Strawberry rivers, are many scattering settlements, as also on the Washita, Cadeau, Little Missouri, [219] and the several forks of Little river. The settlements upon Red river extend upward to the Kiamesha, a distance of about nine hundred miles from its mouth, following the meanders of the river.

The settlements of the section under consideration are most numerous in those parts represented, in the fore-

going description, as being variegated with prairies and woodlands alternating with each other. In the valley of the Arkansa, however, which is generally clad in rich forests and luxuriant cane brakes, prairies are seldom to be met with, and settlers have had recourse to clearing the land necessary for their plantations.

In addition to the white settlements above pointed out, there are numerous villages and settlements of the Cherokee Indians extending along the Arkansa, from the mouth of Point Remove creek upward to Mulberry river, a distance of about one hundred miles. These settlements, in respect to the comforts and conveniences of life they afford, appear to vie with, and in many instances even surpass, those of the Americans in that part of the country.

There are a few villages of the Quawpaws or Arkansas, and Choctaws, situated on the south side of the Arkansa river, below the high lands. They are not numerous, subsist principally upon game and Indian corn of their own raising, and have ever been friendly to the whites. Upon the river St. Francis are a few settlements of the Delawares and Shawnees, dispersed remnants of those unfortunate nations. The several bands of the Osage nation resident upon the Verdigrise, and upon the head waters of Osage river, also the Konzas Indians living upon the river bearing their name, are included within this section of the country.

In regard to climate, this region, as it expands through more than eight degrees of latitude, may be expected to afford a considerable variety; and the position is sufficiently verified by the commencement [220] and progress of annual vegetation. The change of climate is also indicated by certain peculiarities observable in the vege-

table products of different parts of the country. For example, vegetation begins at least a month earlier in the southern than in the northern extreme of the region. The Spanish moss disappears northwardly of the 33d degree of north latitude; cotton and indigo cannot be cultivated to advantage in a latitude higher than 36 or 37 degrees; and the cane brake is seldom found north of $37\frac{1}{2}$ degrees.

In regard to the salubrity of the climate, there is also a diversity, depending upon local circumstances rather than upon the temperature of the weather. A luxuriant soil yielding its products to decay and putrefy upon the ground, also stagnant waters, flat lands and marshes in which the river valleys of this region abound, cannot fail to load the atmosphere with pestilential miasmata, and render the country unhealthy, wherever these occurrences are to be met with. But it is presumed that the causes of disease will gradually be exterminated as the population of the country increases.

Of the rivers of this region there are many that are navigable for keel-boats of several tons burden, but all of them have more or less obstructions from shoals and frosts at different periods. The Arkansa, which, in point of magnitude and extent, deservedly ranks second amongst the tributaries of the Mississippi (the Missouri being the first), is navigable to the mouth of the Neosho, or Grand river, a distance of about six hundred miles. In this part of the river, however, the navigation is liable to obstructions, for want of a sufficient depth of water, during a period of two and a half or three months, commencing in July. Occasional obstructions are also imposed by ice forming in the river during the winter season, but these

are seldom of long continuance, the winters being usually short and mild. As the freshets [221] of the river seldom prevail more than a few days at a time, and are usually attended by sudden rises and falls of the water, boats of moderate draft and burden only are suited to its navigation. The Arkansa is navigable at all seasons for boats of this description about two hundred miles, which comprehends the distance by the meanders of the river from the Mississippi to the commencement of the high lands. Above the mouth of the Neosho it spreads to a much greater width than below, and the water is more extensively diffused over its bed, which renders the shoals more numerous and the navigation more precarious. This part of the Arkansa cannot indeed be considered navigable, even for pirogues of a large size, except during the short period of a freshet, which is seldom long enough to complete a voyage of one hundred miles ascending and descending.

The Red river is navigable, during most of the year, to the Great Raft, about five hundred miles from its mouth. At this place its navigation is effectually obstructed, except in a high stage of water, when keel-boats of ten or fifteen tons burden may pass around it and ascend several hundred miles above. That part of the river situated above the Raft, however, like the upper part of the Arkansa, is rendered impassable for boats of burden, by shoals and sand-bars.

The Washita, tributary to Red river, is navigable many miles. That part of it particularly situated within the valley of the Mississippi, and denominated Black river, admits of constant navigation for boats of considerable burden. The Little river, which is also tributary to Red river, together with its forks, heretofore enumerated,

is navigable in high water. White river is navigable in a moderate stage of water between three and four hundred miles. Also the Big Black, its principal tributary, and several branches of the river last mentioned, viz. the Strawberry, Currant, [222] Eleven Point, and Spring rivers. The navigation of the St. Francis is blocked up near its mouth, and rendered impassable for boats of every description, by rafts of logs and drift-wood, completely choking the channel of the river, and in many places occupying the whole of its bed for the distance of several miles together. The Merameg is also navigable in a moderate stage of water for many miles.

The Gasconade, Osage, and Konzas rivers are navigable in the spring season, but their navigation seldom extends far inland from their mouths, being obstructed by shoals or rapids.

Of the rivers tributary to the Missouri, it is remarkable that their mouths are generally blocked up with mud, consequent to the subsidence of the summer freshet of that river, which usually takes place in the month of July. The reason is obvious; the freshets of the more southerly tributaries are discharged early in the season, and wash from their mouths the sand and mud previously deposited therein, leaving them free from obstructions. These freshets having subsided, the more northerly branches discharge their floods, formed by the melting of the snow at a later period. The Missouri being swollen thereby, backs its waters, charged with mud, considerable distances up the mouths of the tributaries before alluded to. The water here becoming stagnant, deposits its mud; and the tributaries, having no more freshets to expel it, remain with their mouths thus obstructed till the ensuing spring.

The lower part of the Canadian river, although it is included within the section under consideration, will be described in the sequel of the report, in connexion with the rest of that river.

Of the animals found in the several sections of country above described, there are a great variety in almost every department of zoology. But as most of them are common in other parts of the United States, they need not to be enumerated here.

[223] *Of the country situated between the meridian of the Council Bluff and the Rocky Mountains*

We next proceed to a description of the country westward of the assumed meridian, and extending to the Rocky Mountains, which are its western boundary. This section embraces an extent of about four hundred miles square, lying between 96 and 105 degrees of west longitude, and between 35 and 42 degrees of north latitude.

Proceeding westwardly across the meridian above specified, the hilly country gradually subsides, giving place to a region of vast extent, spreading towards the north and south, and presenting an undulating surface, with nothing to limit the view or variegate the prospect, but here and there a hill, knob, or insulated tract of table-land. At length the Rocky Mountains break upon the view, towering abruptly from the plains, and mingling their snow-capped summits with the clouds.

On approaching the mountains, no other change is observable in the general aspect of the country, except that the isolated knobs and table-lands above alluded to become more frequent and more distinctly marked,

the bluffs by which the valleys of watercourses are bounded present a greater abundance of rocks, stones lie in greater profusion upon the surface, and the soil becomes more sandy and sterile. If, to the characteristics above intimated, we add that of an almost complete destitution of woodland (for not more than one thousandth part of the section can be said to possess a timber-growth) we shall have a pretty correct idea of the general aspect of the whole country.

The insulated tracts herein alluded to as table-lands, are scattered throughout the section, and give to the country a very remarkable appearance. They rise from six to eight hundred feet above the common [224] level, and are surrounded in many instances by rugged slopes and perpendicular precipices, rendering their summits almost inaccessible. Many of them are in this manner completely insulated, while others are connected with the plains below by gentle acclivities, leading from their basis to their summits, upon one side or other of each eminence. These tracts, as before intimated, are more numerous, but less extensive in the vicinity of the Rocky Mountains than they are farther eastward; and in the former situations, they are more strikingly characterized by the marks above specified than in the latter.

The geological formations that present themselves along the declivities of those heights are principally horizontal strata of secondary sandstones, and breccia or puddingstone, alternating with each other. Clinkstone prevails upon the surface of them in many places, but in general the superior strata are rocks of the description just before mentioned. These tracts are denominated tabular, not from any flatness of surface by which

they are characterized, but from their appearance at a distant view, and from the horizontal disposition of the stratifications imbedded in them. Their surfaces are usually waving, and in some instances rise into knobs and ridges of several hundred feet high; many of them are clad in a scanty growth of pitch pine, red cedar, scrubby oaks, &c., while others exhibit a bald or prairie surface.

By far the greater proportion of this section of country is characterized by a rolling and plain surface, which may be alleged not only of the space included within the limits above assigned, but of extensive portions of country north and south of it. Although the elevated table-lands, a description of which has just been given, are situated within this region, they occupy but a small proportion of it. In addition to these inequalities in the surface of the country, there are numerous mounds or knobs of different magnitude, and occasionally swells of greater [225] or less extent, which contribute to give a pleasing variety to the prospect. The country is also divided into extensive parterres by the valleys of rivers and creeks, which are usually sunk 150 or 200 feet below the common level, and bounded in some places by perpendicular precipices, and in others by bluffs, or banks of gentle slopes.

Immediately at the base of the mountains, and also at those of some of the insular table-lands, are situated many remarkable ridges, rising in the form of parapets, to the height of between fifty and one hundred and fifty feet. These appear to have been attached to the neighbouring heights, of which they once constituted a part, but have, at some remote period, been cleft asunder from them by some extraordinary convulsion of nature, which has prostrated them in their present condition.

The rocky stratifications, of which these ridges are principally composed, and which are exactly similar to those of the insulated table-lands, are variously inclined, having various dips, from forty-five to eighty degrees.

Throughout this section of country the surface is occasionally characterized by water-worn pebbles, and gravel of granite, gneiss, and quartz, but the predominant characteristic is sand, which in many instances prevails almost to the entire exclusion of vegetable mould. Large tracts are often to be met with, exhibiting scarcely a trace of vegetation. The whole region, as before hinted, is almost entirely destitute of a timber-growth of any description. In some few instances, however, sandy knobs and ridges make their appearance, thickly covered with red cedars of a dwarfish growth. There are also some few tracts clad in a growth of pitch pine and scrubby oaks; but, in general, nothing of vegetation appears upon the uplands but withered grass of a stinted growth, no more than two or three inches high, prickly pears profusely covering extensive [226] tracts, and weeds of a few varieties, which, like the prickly pear, seem to thrive best in the most arid and sterile soil.

In the vicinity of the Rocky Mountains, southwardly of the Arkansa river, the surface of the country, in many places, is profusely covered with loose fragments of volcanic rocks. On some occasions, stones of this description are so numerous as almost to exclude vegetation. A multiplicity of ridges and knobs of various sizes, containing rocks of this character, also make their appearance. All these formations seem to be superincumbent upon horizontal strata of secondary sandstone. But the volcanoes whence they originated have left no vestiges by

which their exact locality can be determined. In all probability, they were extinguished previously to the recession of the waters that once inundated the vast region between the Alleghany and Rocky Mountains.

Of the rivers that have their courses through this section, those of most note are the Platte, the Konzas and its forks, the Arkansa, and the Canadian tributary to the Arkansa. The Platte rises in the Rocky Mountains, and after an easterly course of about eight hundred miles, falls into the Missouri, at the distance of about seven hundred miles from the Mississippi. It derives its name from the circumstance of its being broad and shoal; its average width being about twelve hundred yards, exclusive of the islands it embosoms; and its depth, in a moderate stage of water, so inconsiderable, that the river is fordable in almost every place. The main Platte is formed of two confluent tributaries of nearly equal size, called the North and South forks, both of which have their sources considerably within the range of the Rocky Mountains. They unite about four hundred miles westward from the mouth of the Platte, having meandered about the same distance eastwardly from the mountains. Besides these, [227] the Platte has two considerable tributaries, the one called the Elk Horn, entering a few miles above its mouth, and the other the Loup Fork, entering about ninety miles above the same place. The valleys of the Platte and its several tributaries are extremely broad, and in many places considerably fertile. They gradually become less fertile on ascending from the mouths of the rivers on which they are situated, till at length they exhibit an arid and sterile appearance. The alluvion of which the bottoms are composed contains a large proportion of sand, which, added to

the nitrous and saline matter blended with it, occasions frequent appearances of complete barrenness. Magnesia also appears to be a component part of the soil, a quality invariably derogatory to the fertility of any soil. The valley of the Platte, from its mouths to its constituent forks, spreads to the width of ten or twelve miles, and forms a most beautiful expanse of level country. It is bounded on both sides by high lands, elevated twenty-five or thirty feet above the valley, and connected therewith by gentle slopes.

The river in several places expands to the width of many miles, embosoming numerous islands, some of which are broad and considerably extensive, and all of them covered with a growth of cotton-wood and willows. These are the only woodlands that make their appearance along the river, and in travelling westward these become less numerous and extensive, till at length they entirely disappear. Copses and skirts of woodland again present themselves in the neighbourhood of the mountains, but they are of small magnitude, and the trees they furnish are of a dwarfish growth. For a distance of nearly two hundred miles, commencing at the confluence of the North and South forks, and extending westwardly towards the mountains, the country is almost entirely destitute of woodland, scarcely a tree, bush, or even a shrub, making its appearance.

[228] The Platte is seldom navigable, except for skin canoes, requiring but a moderate depth of water, and for these only when a freshet prevails in the river. No attempts have ever been made to ascend the river in canoes for any great distance; the prevalence of shoals, and the rapidity of the current, discouraging such an undertaking.

The bed of the Platte is seldom depressed more than six or eight feet below the surface of the bottoms, and in many places even less; and spreads to such a width, that the highest freshets pass off without inundating the bottoms, except in their lowest parts; the rise of the water, on such occasions, being no more than five or six feet.

In order to account in some measure for the diversity of soil observable in the vallies of most of our western rivers, it may not be improper in this place to assign one of the principal causes that operate in producing this effect. The alluvial deposits of which the river bottoms are formed, consist of particles of mud and sand, more or less minute. The coarser and more ponderous particles are of course soonest deposited, while the finer are transported by the current to a greater distance, and deposited near the mouths of the rivers. Thus it happens, that the bottoms situated nearest to the sources of the western rivers, are sandy, and contain but a small proportion of vegetable mould, while those nearer their mouths are generally furnished with a rich and fertile loam.

The Konzas, or Konzays, as it is pronounced by the Indians, is made up of two considerable streams, heading in the plains between the Platte and Arkansa rivers, called the Republican and Smoky-hill forks; tributary to the former of these, are the Solomon's and Salim forks, of less magnitude, rising also in the same plains. The Konzas is navigable only in high freshets for boats of burden, and on such occasions not more than one hundred and fifty or two hundred miles, the navigation being obstructed by shoals. [229] The character of this river and its several branches is similar to that of the Platte and its tributaries. Woodlands are seldom to be met with,

except in narrow skirts and small copses along the water-courses. Much of the country situated upon its forks is said to be possessed of a good soil, but is rendered uninhabitable for want of timber and water. The bottoms are possessed of a light sandy soil, and the uplands are in many places characterized by aridity and barrenness. The surface for the most part is rolling, but in some instances inclines to hilly.

That portion of the Arkansa included within the section under consideration has a bed or channel varying in width from four hundred yards to more than a mile, exclusively of islands. In the neighbourhood of the mountains, its width does not exceed fifty or sixty yards, gradually growing wider in its progress downward. Its valley, for a distance of more than one hundred miles from the place where it issues from the mountains, contains a considerable timber-growth, principally of cotton-wood, in skirts bordering upon the river, which occasionally embosoms islands clad in the same kind of growth. Every appearance of timber, however, is lost on a further progress eastward, and nothing is presented to variegate or adorn the prospect inland, but a broad expanse of waving prairies.

Proceeding eastward along the river, its valley gradually widens, and the bluffs or banks by which it is bounded become less elevated and abrupt. The bottoms rise but a few feet above the water-level of the river, but the freshets, having a broad bed like that of the Platte to expand upon, seldom rise so high as to inundate the bottoms. This part of the Arkansa, as before hinted, cannot be considered as navigable, except for boats of light burden during the prevalence of a freshet. In a very low

stage, the river is said to disappear in many places, the [230] whole of its water passing off through the immense body of sand of which its bed is composed.

The Arkansa, having a direction nearly east and west, has no great variety of climate to traverse in its course from the mountains to the Mississippi; consequently there is no succession of thaws taking place upon the river, calculated to maintain a freshet for any considerable length of time. The freshets are occasioned by a simultaneous melting of the snow throughout the whole extent of the river, and by showers of rain, which, falling upon a rolling surface, is quickly drained off, and causes sudden, but seldom excessive rises in the river. I have witnessed, in the Arkansa, no less than three considerable rises and falls of the water in the course of two weeks.

The most considerable streams tributary to this part of the Arkansa are the Negracka or Red Fork, and the Newsewketongu, or Grand Saline, on the south, and the Little Arkansa and Stinking Fork on the north side. The Negracka rises within fifty or sixty miles of the mountains, and after meandering eastwardly between four and five hundred miles, unites with the Arkansa at the distance of about nine hundred miles from the mouth of the latter. The Newsewketongu has its source in the plains between the Arkansa and Canadian rivers, and unites with the former about one hundred and fifty miles below the Negracka. The head waters of the Little Arkansa interlock with those of the Smoky-hill Fork of the Konzas, and are discharged into the Arkansa, about fifteen hundred miles above its mouth. The Stinking Fork rises amongst the head-waters of the Neosho, and enters the Arkansa about eight hundred miles from its mouth.

Besides these, there are many other streams of smaller size entering on both sides of the river.

The Canadian rises at the base of the Rocky Mountains, and after a meandering course of about [231] one thousand miles, enters the Arkansa at the distance of about five hundred and fifty miles from the mouth of the latter. This river has generally been represented, upon the maps of the country, as having a north-easterly course; whereas its source is nearly in the same latitude as its confluence with the Arkansa, consequently its general course is nearly east. In its course, it forms an extensive curve to the southward, leaving a broad space between it and the Arkansa, in which several streams, many hundred miles in length, tributary to both of these rivers, have their origin and course.

This river has a broad valley, bounded by bluffs from two to five hundred feet high, faced with rocky precipices near its source, and presenting abrupt declivities, intersected by numerous ravines lower down. It has a spacious bed, depressed but a few feet below the bottoms, and exhibiting one continued stratum of sand through the greater part of its length. It is the channel through which the water of a vast extent of country is carried off, yet, during most of the summer season, it is entirely destitute of running water throughout a large proportion of its extent, a circumstance in proof of the aridity of region drained by it. Fifty miles above its mouth, it receives at least two-thirds of its water from its principal tributary, denominated the North Fork. This fork rises between the Arkansa and Canadian, and has a meandering course of about seven hundred miles. Six miles above the fork just mentioned, another tributary enters the Canadian

called the South Fork, about half as large as the other. Notwithstanding the supplies afforded by these two tributaries, the Canadian has not a sufficiency of water in summer to render it navigable even to their mouths. At the distance of twenty miles above its mouth, a chain of rocks (slaty sandstone) extends across the bed of the river, but occasions no considerable fall. A little above the entrance of the South Fork, is another of the same [232] description, forming rapids of moderate descent, not more than four hundred yards in length. With these exceptions, the bed of the river presents no rocky formations in place, for more than four hundred miles from its confluence with the Arkansa. About three hundred and fifty miles from that point, beds of gypsum, or plaster of Paris, begin to make their appearance in the bluffs fronting upon the river, and upon the declivities of the highland knobs. A great abundance of this article is to be met with, not only upon the Canadian, but also upon the upper part of the Arkansa. The hills, in which it is imbedded, are composed of ferruginous clay and fine sand of a deep red complexion. Hence the Arkansa derives the colouring matter that gives to its waters their reddish hue.

The bottoms of the Canadian, in the neighbourhood of its mouth, are possessed of a soil exceedingly prolific; but, like those of the other rivers of this region, the more remote their situation from the mouth of the river, the more sandy and sterile is their appearance. Its valley is plentifully supplied with timber of an excellent quality, for a distance of about two hundred miles on the lower part of the river; and the high lands, for nearly the same distance, are agreeably diversified with prairies and woodlands. This portion of the river is situated eastward of

the assumed meridian, and the country upon it has already been partially described in a former part of this report.

The woodland growth, upon the lower part of the Canadian, consists of cotton-wood, sycamore, white, blue, and black ash, swamp cedar, red elm, coffee tree, yellow wood, sugar tree, box elder, white and black walnut, wild cherry, mulberry, &c. in the river valley; and hickory, white and post oak, black jack, black oak, &c. upon the adjacent uplands. On a progress westward, the most valuable of the timber trees above enumerated disappear, till at length occasional groves of cotton-wood, mingled with mulberry, [233] red elm, and stunted shrubbery of various kinds, constitute the only woodlands of the country. On this occasion, it may be observed, that the cane or reed, the pea-vine, pawpaw, spice-wood, hop-vine, and several other varieties of shrubs and vines common only to rich soils, are no where to be found within this section, or westward of the proposed meridian.

The country of the Canadian above that last considered, or that portion of it west of the assumed meridian, appears to be possessed of a soil somewhat richer than the more northerly parts of the section, but exhibits no indications of extraordinary fecundity in any part of it. Proceeding westward, a very gradual change is observable in the apparent fertility of the soil, the surface becoming more sandy and sterile, and the vegetation less vigorous and luxuriant. The bottoms appear to be composed, in many places, almost exclusively of loose sand, exhibiting but few signs of vegetation. Knobs and drifts of sand, driven from the bed of the river by the violence of the wind, are piled in profusion along the margin of the river throughout the greater part of its length. It is remarkable,

that these drifts are in many instances covered with grape vines of a scrubby appearance, bearing fruit in the greatest abundance and perfection. The vines grow to various heights, from eighteen inches to four feet, unaccompanied, in some instances, by any other vegetable, and bear a grape of a dark purple or black colour, of a delicious flavour, and of the size of a large pea or common gooseberry.

The waters of this section, almost in every part of it, appear to hold in solution a greater or less proportion of common salt and sulphate of magnesia, which, in many instances, render them too brackish or bitter for use. Saline and nitrous efflorescences frequently occur upon the surface, in various parts of the country, and incrustations of salt, of considerable [234] thickness, are to be found in some few places south of the Arkansa river. As to the existence of rock salt in a mineral state some doubts are to be entertained, if the decision is to rest upon the character of the specimens exhibited as proofs of the fact. The several examples of this formation that we have witnessed, are evidently crystalline salt deposited by a regular process of evaporation and crystallization, and formed into concrete masses or crusts upon the surface of the ground.

Indications of coal are occasionally to be seen, but this mineral does not probably occur in large quantities. The geological character of this section is not such as to encourage the search for valuable minerals. A deep crust of secondary sandstone, occasionally alternating with breccia, with here and there a superstratum of rocks of a primitive type, are the principal formations that present themselves.

Of the animals of this region, the buffaloe or bison

ranks first in importance, inasmuch as it supplies multitudes of savages not only with the principal part of their necessary food, but also contributes to furnish them with warm clothing. The flesh of this animal is equal, if not superior, to beef, and affords not only a savoury but a wholesome diet. A large proportion of this section, commencing at the assumed meridian, and extending westward to within one hundred miles of the Rocky Mountains, constitutes a part only of their pasture ground, over which they roam in numbers to an incredible amount. Their range extends northwardly and southwardly of the section, as far as we have any particular account of the country. The animal next in importance is the wild horse, a descendant, no doubt, of the Spanish breed of horses, to which its size, form and variety of colours, show that it is nearly allied. In regard to their contour, symmetry, &c. they afford all the varieties common to that breed of horses. They are [235] considerably numerous in some parts of the country, but not abundant. They are generally collected in gangs, but are sometimes solitary.

Grizzly or white bears are frequently to be seen in the vicinity of the mountains. They are much larger than the common bear, endowed with great strength, and are said to be exceedingly ferocious. The black or common bears are numerous in some parts of the country, but none of these animals are found remote from woodlands, upon the products of which they in a great measure depend for their subsistence.

The common deer are to be met with in every part of this section, but are most numerous in the vicinity of woodlands. The black-tailed or mule deer is found only in the neighbourhood of the mountains; hilly and broken

lands seem to afford them their favourite pasture ground. The elk is also an inhabitant of this section, but is not to be found remote from woodlands. The cabric wild goat, or, as it is more frequently called, the antelope, is common. They are numerous, and with the buffaloe are the common occupants of the plains, from which they retire only in quest of water.

Wolves are exceedingly numerous, particularly within the immediate range of the buffaloe. Of these there are many varieties, distinguishable by their shape, size and colour.

The marmot, commonly called the prairie dog, is more abundant throughout this section than any other quadruped. They live in villages scattered in every direction, and thickly inhabited; a single village in some instances occupying a tract of ground three or four miles in extent. Their habitations are burrows three or four inches in diameter, situated at the distance of fifteen or twenty paces asunder. Their habits and manners in other respects are peculiarly interesting. They subsist on vegetables; their [236] flesh is similar to that of the ground hog, and their hair equally as coarse.

The beaver, otter, mink, and muskrat, are numerous upon the rivers, creeks, and rivulets issuing from the mountains, and generally upon those whose valleys are supplied with woodland.

Badgers, raccoons, hares, polecats, porcupines, many varieties of squirrels, panthers, wild cats, lynxes and foxes of several species, are also inhabitants of this section. Besides these, the country affords a great variety and abundance of reptiles and insects, both venomous and harmless.

Of the feathered tribes, no very considerable variety is observable. The turtle-dove, the jay, the barn swallow, the quail (partridge of the Middle States), the owl, whip-poor-will, and lark, which seem more widely distributed over the territory of the United States than any other birds, are found here. Several varieties of the hawk, containing some new species, the bald and gray eagle, the buzzard, raven, crow, jackdaw, magpie, turkey, two or three varieties of the grouse, pheasant, pigeon, many varieties of the sparrow and fly-catcher, the whooping or sandhill crane, curlew, sandpiper, together with a variety of other land and water fowls, are more or less numerous in this region. It is remarkable that birds of various kinds common to the sea-coast, and seldom found far in the interior, pervade the valley of the Mississippi to a great distance from the gulf of Mexico, and frequent the regions adjacent to the Rocky Mountains.

In regard to this extensive section of country, I do not hesitate in giving the opinion, that it is almost wholly unfit for cultivation, and of course uninhabitable by a people depending upon agriculture for their subsistence. Although tracts of fertile land considerably extensive are occasionally to be met with, yet the scarcity of wood and water, almost [237] uniformly prevalent, will prove an insuperable obstacle in the way of settling the country. This objection rests not only against the section immediately under consideration, but applies with equal propriety to a much larger portion of the country. Agreeably to the best intelligence that can be had, concerning the country both northward and southward of the section, and especially to the inferences deducible from the account given by Lewis and Clarke of the country situated be-

tween the Missouri and the Rocky Mountains above the river Platte, the vast region commencing near the sources of the Sabine, Trinity, Brases, and Colorado, and extending northwardly to the forty-ninth degree of north latitude, by which the United States' territory is limited in that direction, is throughout of a similar character. The whole of this region seems peculiarly adapted as a range for buffaloes, wild goats, and other wild game; incalculable multitudes of which find ample pasturage and subsistence upon it.

This region, however, viewed as a frontier, may prove of infinite importance to the United States, inasmuch as it is calculated to serve as a barrier to prevent too great an extension of our population westward, and secure us against the machinations or incursions of an enemy that might otherwise be disposed to annoy us in that part of our frontier.

The Indians of the section last described, whose numbers are very limited compared with the extent of country they inhabit, will be considered in the sequel of this report.

Of the Rocky Mountains

This range of mountains has been distinguished by a variety of appellations, amongst which the following are the most common, viz. Rocky, Shining, Mexican, Chippewyan, Andes, &c. The general [238] course of the range is about N.N.W. or S.S.E. Its breadth varies from fifty to one hundred miles. They rise abruptly out of the plains, which lie extended at their base on the east side, towering into peaks of great height, which renders them visible at the distance of more than one hundred miles

eastward from their base. They consist of ranges, knobs, and peaks, variously disposed, among which are interspersed many broad and fertile valleys. The more elevated parts of the mountains are covered with perpetual snows, which contribute to give them a luminous and at a great distance even a brilliant appearance, whence they have derived the name of Shining Mountains.

Between the Arkansa and Platte, on a small creek tributary to the former, is situated a high part of the mountains, denominated the "Highest Peak" on many maps of the country, and said to be more elevated than any other part within the distance of one hundred and fifty or two hundred miles. This peak, whose summit has been accounted inaccessible, was ascended by a detachment of the expedition conducted by Dr. James, from which circumstance it has been called James's Peak. Its elevation above the common level, ascertained by a trigonometrical measurement, is about eight thousand five hundred feet. But the correctness of the statement, that it is higher than any other parts of the mountains within the distance above mentioned, is questionable. Judging from the position of the snow near the summits of other peaks and ridges at no great distance from it, a much greater elevation is apparent.

The mountains are clad in a scattering growth of scrubby pines, oak, cedar, and furze, and exhibit a very rugged and broken aspect. The rocky formations embodied in them, contrary to the opinion generally received, are of a primitive character, consisting of granite, gneiss, quartz rocks, &c. It [239] should be remarked, however, that a deep crust of secondary rocks, the same as the stratifications of the plains before mentioned, appears

to recline against the east side of the mountains, extending upward from their base many hundred feet.

At the base of James's Peak above designated, are two remarkable springs of water, considerably copious, and strongly impregnated with fixed air. At the place also where the Arkansa issues from the mountains, are several medicinal springs on the north side of the river, rising in a small area at the base of the mountain. These springs were discovered by Captain Bell, and, in consequence, I have taken the liberty to call them Bell's Springs. They are six in number, one of which is strongly impregnated with fixed air, another with sulphurated hydrogen, and the rest with salt and sulphur; the water of all being more or less chalybeate.

Of the Indians inhabiting the section of country last described

This country is exclusively inhabited by savages, no other beings of the human family having fixed their abode within it. They consist of the following tribes and nations, whose numbers, places of residence, and mode of life, will be subjects of consideration as far as our knowledge of them extends.

The Otoes, or as they are called in their own language, the Wahtooh-tah-tah, reside in a permanent village of dirt or earthen lodges, on the south bank of the river Platte, about fifty miles from its confluence with the Missouri, and thirty miles south-westwardly from the Council Bluff. The principal remnant of the old Missouries, who have become extinct as a nation, have their residence with the Otoes. In the course of the last winter, whilst these Indians were absent from their

village on their winter-hunt, their town was partly burnt by the [240] Sauks, which misfortune induced them to take up a temporary abode upon Salt river, a few miles from their former residence. But it was generally supposed that they would return again, and rebuild their town. The name of their principal chief is Shongotongo, or Big Horse. Probable number of lodges 100, of persons 1400. The Otoes and Missouries are esteemed a brave people, and are friendly towards the Americans. They are at war with the Sauks, Foxes, Sioux, Osages, Ietans, and other Indians west of the Missouri. A small band of the Ioways resided for some time with these Indians, but not being able to harmonize with them, lately returned to their old village on the river De Moyen of the Mississippi. Their principal chief, usually called Hard Heart, being dissatisfied with the conduct of his tribe, remains with the Otoes.

The Omawhaw, or as it is commonly written the Maha nation, exultingly boast that they have never killed an American. On the contrary, they have ever been friendly, and still hold the Americans in the highest estimation. Under the influence of their present principal chief, Ongpatonga, or the Big Elk, they never go to war except in the pursuit of a predatory war-party, in consequence of which the traders have given them the reputation of being cowardly. But the history of this people shows that they have been as ambitious of martial renown, and have acquired as large a share of it, as any of their neighbours. They formerly resided in a village of dirt lodges upon Omawhaw creek, a small stream entering the Missouri about two hundred miles above the Council Bluff; but they have recently abandoned it, and are about

building a town on Elk Horn river. Their number of souls is about 1500.

The Puncahs have their residence in a small village of dirt lodges, about one hundred and eighty miles above Omawhaw creek. This tribe have a common origin with the Omawhaws, and speak the same language. [241] Their principal chief is called Smoke Maker. Their number is about 200 souls.

The tribes above enumerated evidently sprung from the same common stock, the language of all being radically the same. They have a tradition that their fathers came from beyond the Lakes.

The Pawnees are a race of Indians distinct from the preceding, their language differing radically from that of the Indians alluded to. The Pawnees consist of three distinct bands, that have their residence at present on a branch of the river Platte called the Loup Fork, about sixty miles from the mouth of the latter, and between 100 and 115 miles westward from the Council Bluff. The three bands are distinguished by the appellation of the Grand, the Republican, and the Loup Pawnees. The two former acknowledge a common origin, but the latter deny having any natural affinity with them, though their habits, language, &c. indicate the same ancestry. They live in three villages, included within an extent of about seven miles on the north bank of the Loup Fork, all compactly built.

The village of the Grand Pawnees is situated immediately on the bank of the river, and contains about 180 earthen lodges, 900 families, or 3500 souls. The name of the principal chief of this village is Tarrarecawaho, or Long Hair.

The village of the Republican Pawnees is situated about three miles above that of the Grand Pawnees, contains about 50 lodges, 250 families, or 1000 souls. The name of their principal chief is Fool Robe, who is very much under the influence of Long Hair. This band separated many years since from the Grand Pawnees, and established themselves upon the Republican fork of Konzas river, where they were visited by Pike on his tour westward. They seem to be gradually amalgamating with the present stock, and their village wears a declining aspect.

The village of the Loup Pawnees, or Skeree, as they call themselves, is situated four miles above [242] that last mentioned, immediately on the bank of the river; it contains about 100 dirt lodges, 500 families, or 2000 souls, making an aggregate of 6500 souls belonging to the three villages. The name of their principal chief is the Knife Chief. A few years since the Loup Pawnees had a custom of annually sacrificing a human victim to the Great Star, but this was abolished by their present chief, aided by the noble daring of his gallant son. They appear unwilling to acknowledge their affinity with the other Pawnees; but their language being very nearly the same, proves them to be of the same origin.

Although these bands are independent of each other in all their domestic concerns, government, &c., yet in their military operations they generally unite, and warfare becomes a common cause with them. Their arms are principally bows and arrows, lances, war-clubs, and shields, with some few firearms. They are expert horsemen, but generally fight on foot. They are more numerous, and accounted more formidable in warfare, than any

other combination of savages on the Missouri. Their confidence in their own strength gives them a disposition to domineer over their weaker neighbours. They are at war with the Osages, Konzas, Sioux, Ietans, Kaskaias, Kiaways, Shiennes, Crows, &c.

The several tribes above described cultivate maize or Indian corn, pumpkins, beans, watermelons, and squashes. They hunt the bison or buffaloe, elk, deer, beaver, otter; the skins of which they exchange with the traders for fusees, powder, and lead, kettles, knives, strouding, blankets, beads, vermilion, silver ornaments, and other trinkets. They prefer the Mackinaw guns, blankets, &c., and will give a higher price for them, knowing that they are greatly superior to those furnished by American traders.

The Konzas and Osages, both of which reside in the vicinity of the meridian assumed as the eastern boundary of this section, may here be admitted to a more particular consideration than that already [243] allowed them in this report. The Konzas Indians reside in a village of earthen lodges, situated on the north side of the river bearing their name, about one hundred miles from its mouth. Their village consists of about 130 lodges, and contains about 1500 souls. This tribe was formerly very troublesome to our traders, frequently robbing them of their goods, but since the establishment of the upper posts on the Missouri they have become very friendly. They are at war with most of the other tribes and nations herein enumerated, except the Osages and Otoes, with the last of whom they have lately made peace, through the agency of Major O'Fallon, Indian agent for the Missouri. Several Indians of the Missouri tribe reside with them.

The Osages are divided into three bands or tribes, called the Grand Osage, the Little Osage, and Clermont's band; the two former of which reside in permanent villages, situated on the head-waters of Osage river, and the last upon the Verdigrise, about sixty miles from its confluence with the Arkansa. According to Pike, whose estimate of their numbers is probably near the truth, the Grand Osage band amounts to 1695, the Little Osage to 824, and Clermont's to 1500 souls, making an aggregate of about 4000. These Indians are not accounted brave by those inhabiting the country to the north and east of them, but are the dread of those west and south of them. Although they have occasionally been chargeable with depredations committed against the whites, they have been provoked to the perpetration of them by aggressions or trespasses on the part of the latter, or else the depredations have been committed by malcontents of the nation, who will not be governed by the counsel of their chiefs. These Indians hold the people and government of the United States in the highest estimation, and have repeatedly signified their strong desire to be instructed by them in the arts of civilization. The United States have purchased from them large and valuable tracts of country [244] for mere trifles, which the Osages have been the more willing to relinquish, under the prospect and encouragement given them, that the Americans would become their neighbours and instructors. They are in a state of warfare with all the surrounding tribes and nations of Indians, except the Konzas. It is said, that they are about forming an alliance with the Sauks and Fox Indians of the Mississippi, and that the latter are preparing to remove to their country. They have

recently driven the Pawnees of Red river from their place of residence, and compelled them to seek an abode upon the head waters either of the Brases or Colorado.

The Konzas and Osages are descendants from the same common origin with the Otoes, Missouries, Ioways, Omawhaws, and Puncahs, to which may be added the Quawpaws, and several other tribes, not mentioned in this report. The languages of all of them are radically the same, but are now distinguished by a variety of dialects.

Of the Arrapahoes, Kaskaias, Kiaways, Ietans, and Shiennes

These nations have no permanent residences or villages, but roam, sometimes in society and sometimes separately, over the tract of country constituting the section last described. They hunt the bison principally, and migrate from place to place in the pursuit of the herds of that animal, upon the flesh of which they chiefly subsist. Being thus accustomed to a roving life, they neglect the cultivation of the soil, and are compelled to subsist almost exclusively upon animal food. They formerly carried on a limited trade with the Spaniards of Mexico, with whom they exchanged dressed bison-skins for blankets, wheat, flour, maize, &c.; but their supplies of these articles are now cut off by a war, which they at present are waging against that people. They also, at distant periods, held a kind of fair on a tributary of the [245] Platte, near the mountains (hence called Grand Camp creek), at which they obtained British merchandize from the Shiennes of Shienne river, who obtained the same at the Mandan village from the British traders that frequent that part of our territory. Last winter they traded a

great number of horses and mules with a party of white men, who had ascended Red river, but whence the party came from could not be ascertained; it however appeared probable that they were citizens of the United States, or possibly freebooters from Barataria.

The Shiennes associated with these wandering tribes are a small band of seceders from the nation of the same name residing upon Shienne river. They are said to be daring and ferocious. They are however kept under restraint by the energy and firmness of their chief. The Bear Tooth, who is the principal chief of the Arrapahoes, and the head chief of all these nations, possesses great influence over the whole. His mandates, which are uniformly characterized by discretion and propriety, are regarded by his subjects as inviolable laws.

The Kaskaia and Kiaway languages are very difficult to acquire a knowledge of. Our interpreter, who had lived several years with them, could only make himself understood by the language of signs, with the aid of a very few words of the Crow language, which many of them appeared to understand. Indeed many of the individuals of these different nations seemed to be ignorant of each other's language; for when they met, they would communicate by means of signs, with now and then an oral interjection, and would thus maintain a conversation, apparently without the least difficulty or misapprehension.

These nations are at war with all the Missouri Indians, as far down as the Osages, who are also included amongst their enemies; and it was rumoured that hostilities had recently commenced between them and the Shiennes, upon the river of the same name. [246] Their imple-

ments of war consist of the bow and arrow, the lance, war-club, and shield. They usually fight on horseback, and as horsemen display great skill and activity. Their habitations are leather lodges, which serve them as tents on the march, and dwellings at the places of their encampment.

Widely diffused as these Indians are, and never embodied, it is impracticable even to conjecture their numbers with any degree of probable accuracy. They rove not only throughout the section above specified, but extensively within the range of the Rocky Mountains.

The foregoing remarks concerning the Indians of this part of the country have been made for the most part agreeably to the suggestions of Mr. Say, whose attention was particularly directed to researches of this nature. But having been robbed of his notes upon the customs, manners, traditions, &c. of the western Indians, by the men who deserted from Captain Bell's party, he could give no farther account of them than what his recollection could supply. Of the Konzas, Otoes, Pawnees, and other Indians near the Council Bluff, his notes are considerably extensive; but the vessel on board of which they, with other articles, were shipped from New Orleans, having been obstructed in her passage up the Delaware by ice, we have not yet received them.

Observations embracing several traits of character common to the Indians of the western country

An accurate and extensive knowledge of the numerous tribes and nations of Indians living within the United States' territory can only be attained by a long residence with them. They are seldom communicative, except up-

on subjects intimately connected with their personal experience or present interests and welfare. In regard to matters of an abstract or metaphysical nature their ideas [247] appear to be very limited; at any rate very little is known of their sentiments upon subjects of this kind, owing, in a great measure, to the inability of the persons usually employed as interpreters to converse intelligently concerning them. The delicate trains of thought and reflection attributed to them by writers who have attempted to enlarge our acquaintance with the Indian character, usually have their origin in the ingenuity of the writers themselves. The exploits of their war-parties, and particularly those of individuals, are often recounted, but are seldom transmitted to succeeding generations, unless they are characterized by some signal advantage to the tribe or nation to which the party or individual belongs. Hence their history is very defective, affording but few incidents, and characterized by no regular series of events. In regard to the number of persons, and strength of the several tribes and nations, also the ages of individuals, no precise statements can be made; all the information given under these heads is almost without exception conjectural. In relation to subjects of this kind the Indians are either ignorant or wilfully silent; and deem it an impertinent curiosity that prompts a stranger to the investigation of them.

Notwithstanding these obstacles in the way of acquiring authentic and credible information concerning the savages, yet there are certain traits in their general character that are observable on a partial acquaintance with a variety of tribes and nations, and upon these the following remarks are grounded.

They are, almost without exception, addicted to habits of extreme indolence; self-preservation, self-defence, and recreation being their usual incitements to action. The laborious occupations of the men consist almost exclusively in hunting, warfare, and tending their horses. Their amusements are principally horse-racing, gambling, and sports of various kinds. The cultivation of corn and other vegetables, [248] the gathering of fuel, cooking, and all other kinds of domestic drudgery, is the business of the women, the men deeming it degrading to their dignity to be occupied in employments of this kind. Their religion consists in the observance of a variety of rites and ceremonies, which they practise with much zeal and ardour. Their devotional exercises consist in singing, dancing, and the performance of various mystical ceremonies, which they believe efficacious in healing the sick, frustrating the designs of their enemies, and in giving success to any enterprize in which they may be embarked.

Amongst all these tribes and nations secret associations or councils are common, the proceedings of which are held sacred, and not to be divulged, except when the interests of the people are thought to require a disclosure. To these councils, which they denominate medicine, or rather magic feasts, none are admitted but the principal men of the nation, or such as have signalized themselves by their exploits in battle, hunting, stealing horses, or in any of the pursuits accounted laudable by the Indians.

In these assemblies the policy of making war or peace, and the manner in which it is to be effected, also all matters involving the interests of the nation, are first discussed. Having thus been the subject of deliberation in solemn council (for the proceedings at these feasts are

conducted with the greatest solemnity,) the decision, of whatever nature it may be, is published to the people at large by certain members of the council performing the office of criers. On such occasions, the criers not only proclaim the measures that have been recommended, but explain the reasons of them, and urge the people zealously to support them. It is also the business of the criers, who are generally men of known valour and approved habits, and are able to enforce their precepts by the examples they have set, to harangue the people of their village daily, and exhort them to such a course [249] of life as is deemed praiseworthy. On such occasions, which are usually selected in the stillness of the morning or evening, the crier marches through the village, uttering his exhortation in a loud voice, and endeavouring to inculcate correct principles and sentiments. The young men and children of the village are directed how to demean themselves, in order to become useful and enjoy the esteem of good men, and the favour of the good spirit. In this way they are incited to wage war or sue for peace; and to practise according to their ideas of morality and virtue; and may be swayed to almost any purpose that their elders, for such are their men of *medicine* (or as the term imports, magic wisdom), think proper to execute. They appear to have no laws, except such as grow out of habitual usages, or such as are sanctioned by common consent. The executive of their government seems to be vested in the chiefs and warriors; while the grand council of the nation is composed of the medicine council above mentioned, at which the principal chief presides. In all their acts of devotion, as also on all occasions where their confidence is to be won, or their friendship to be plighted,

the smoking of tobacco seems to be invariably regarded as an inviolable token of sincerity. They believe in the existence of a Supreme Being, whom they denominate "Master of Life" or "Good Spirit," but of his attributes their ideas are vague and confused. They are generally in the habit of offering in sacrifice a portion of the game first taken on a hunting expedition, a part of the first products of the field, and often a small portion of the food provided for their refreshment. In smoking, they generally direct the first puff upward, and the second downward to the earth, or the first to the rising and the second to the setting sun; after which they inhale the smoke into their lungs, and puff it out through the nostrils for their own refreshment.

[250] They have some indistinct notions of the immortality of the soul, but appear to know no distinction of Heaven or Hell, Elysium or Tartarus, as the abode of departed spirits.

The arts of civilized life, instead of exciting their emulation, are generally viewed by the Indians as objects unworthy of their attention. This results, as a natural consequence, from their habits of indolence. They are aware that much labour is requisite in the prosecution of them, and being accustomed from their infancy to look upon manual labour of every description as a drudgery that pertains exclusively to the female part of their community, they think it degrading to the character of men to be employed in them. Hunting, horsemanship, and warfare are the only avocations in which their ambition or sense of honour prompts them to engage.

Their reluctance to forgive an injury is proverbial. "Injuries are revenged by the injured; and blood for

blood is always demanded, if the deceased has friends who dare to retaliate upon the destroyer." Instances have occurred where their revenge has become hereditary, and quarrels have been settled long after the parties immediately concerned have become extinct.

Much has been published in relation to the high antiquity of Indian tradition, of those particularly which relate to their origin and their religion. But from the examples afforded by the several nations of Indians resident upon the Mississippi and its waters, but little proof is to be had in favour of the position. It is not doubted that the immediate objects of their worship have been held in reverence by their predecessors for a long succession of ages; but in respect to any miraculous dispensations of providence, of which they have a traditional knowledge, their ideas are at best exceedingly vague and confused; and of occurrences recorded in sacred history they appear to be entirely ignorant. The knowledge they [251] have of their ancestry is also very limited; so much so, that they can seldom trace back their pedigree more than a few generations; and then know so little of the place whence their fathers came, that they can only express their ideas upon the subject, in general terms, stating, that they came "from beyond the lakes,"—"from the rising or setting sun"—"from the north or south," &c. In some instances, where their term of residence in a place has evidently been of limited duration, they have either lost or conceal their knowledge of the country whence their ancestors came, and assert that the Master of Life created and planted their fathers on the spot where they, their posterity, now live. They have no division of time, except by years, seasons, moons, and days. Particular

periods are distinguished by the growth and changes of vegetables, the migrations, incubations, &c. of birds and other animals.

Their language is of two kinds, viz. verbal and signal, or the language of signs. The former presents a few varieties, marked by radical differences, and a multiplicity of dialects peculiar to individual tribes or nations descended from the same original. The latter is a language common to most, if not all, of the western Indians, the motions or signs used to express ideas being, with some slight variations, the same amongst all of them. Nearly allied to the language of signs is a species of written language which they make use of, consisting of a few symbolical representations, and of course very limited and defective. The figures they make use of have but a faint resemblance to the object described, and are rudely imprinted upon trees, cliffs, &c. by means of paints, charcoal, and sometimes by carving with a knife or other edged tool, and are significant of some movement, achievements, or design of the Indians. A variety of figures of this description are to be seen upon the cliffs, rocks, and trees in places held sacred and frequently resorted to by the Indians, [252] but of their import little is known. Many of these symbols are made by the magicians, or men of medicine, and are probably of sacred or devotional import.

Much intrigue, cunning, and artifice are blended with the policy of the Indians, and judging from their usual practice, it is a favourite and well approved maxim with them, that "the end sanctifies the means." In an interview with strangers it appears to be their first object to ascertain their motives and the objects of their visits; and

after regarding them for some time without a show of curiosity, a variety of interrogatories are proposed, in order to satisfy themselves upon these points. This they appear to do with the view also of scrutinizing into the character and disposition of their guests. In the course of the conversation they become more and more familiar and impertinent, till at length their familiarity is succeeded by contempt and insult. Thus, from the coldest reserve, they are in a short time impelled by curiosity and a propensity to abuse, where they are not in some measure compelled to respect, to the commission of outrages, even without the slightest provocation. This kind of treatment, however, is easily obviated at the commencement of an interview, by resisting every advance made by the Indians towards familiarity, and by uniformly opposing firmness and reserve to the liberties they are disposed to take.

These attributes of the Indian character manifest themselves not only in the well-known stratagems they adopt in warfare, but in the management of their domestic concerns, in which rivalships of one kind or other are created; parties are formed and pretenders arise, claiming privileges that have been withheld from them, and placing themselves at the head of factions, occasionally withdraw from the mother tribe. Thus new tribes are formed and distributed in various directions over the country, with nothing to [253] mark their genealogy, but the resemblance of their language to that of the parent stock, or of other Indians that sprung from the same origin.

The chiefs, or governors of tribes, have their rank and title by inheritance; yet in order to maintain them, and secure themselves in their pre-eminence, they are under

the necessity of winning over to their interests the principal warriors and most influential men of their tribe, whose countenance and support are often essential to their continuance in authority. In conciliating the friendship of these, the chief is often compelled to admit them to participate in the authority with which he is invested, and to bestow upon them any effects of which he may be possessed. Thus it often happens that the chiefs are amongst the poorest of the Indians, having parted with their horses, clothes, trinkets, &c. to ensure the farther patronage of their adherents, or to purchase the friendship of those that are disaffected.

The situation of principal chief is very frequently usurped during the minority of the rightful successor, or wrested from an imbecile incumbent by some ambitious chief or warrior. In this case the ascendancy obtained over the nation by the usurper is gradual, and depends upon the resources of his own mind, aided by his reputation for generosity and valour.

The condition of the savages is a state of constant alarm and apprehension. Their security from their enemies, and their means of subsistence, are precarious and uncertain, the former requiring the utmost vigilance to prevent its infraction, and the latter being attended with no regular supplies of the necessaries of life. In times of the most profound peace, whether at their villages or on a hunting expedition, they are continually on the alert lest they should be surprised by their enemies. By day scouts are constantly kept patrolling for a considerable distance around them, and by night sentinels are posted to give notice of the approach of strangers.

[254] When they engage in a hunt, they generally

abandon their villages, old men, women, and children joining in the enterprize, through fear of being left at home without the strength of their nation to protect them. On their march they endeavour to make as great a display of force as practicable, in order to intimidate any of their enemies that may be lurking to spy out their condition. With this view they are careful to pitch their lodges or tents at the places of their encampment in such a manner, and in such numbers, as to give the impression, at a distance, that they are numerous and formidable. We have witnessed a hunting party on their march, consisting of not more than one hundred persons, including men, women, and children, yet at their encampment more than thirty lodges were pitched, each of which would accommodate at least twelve adult persons.

It is an opinion generally credited, that the Indians are possessed of strong natural appetites for ardent spirits, but there is at least room to doubt of its being well-founded. That the appetites for them are often strong and ungovernable is very certain; but they may be considered as factitious rather than natural, having been created by occasional indulgencies in the use of intoxicating liquors. Instances are not rare in which Indians have refused to accept liquor when offered them. After a long abstinence from food, any thing calculated to allay the cravings of the appetite is eagerly swallowed, and on such occasions nothing perhaps produces such an effect more speedily than spirituous liquors. Indians, while lounging about a trading establishment, are often destitute of food for a considerable time, and can obtain no other kind of refreshment from the trader but liquor, which is bestowed partly in exchange for commodities they may

have to dispose of, and partly by way of encouraging them to return to him with the products of their next hunt. A small draught, on such occasions, produces intoxication, and the sudden [255] transition from a state of gnawing hunger to that of unconcerned inebriety cannot fail to make them passionately fond of a beverage that can thus change their condition so much to their immediate satisfaction. In their use of ardent spirits, the Indians appear to be less captivated with their taste than with their exhilarating effects. The quality of liquor is not a subject of discrimination with them; provided it has sufficient strength to inebriate they are satisfied, let its character in other respects be what it may. Having contracted the habit of intoxication, they seldom appear thankful for liquor, unless it has been bestowed in such quantities as are sufficient to produce that effect.

In the indulgence of their appetites they display but few or no traits of epicurism, choosing those kinds of food that are most nutritive, without regarding their taste or flavour. In the preservation of their food, no pains are taken to render it savoury or palatable; their object is solely to reduce it to a state of security against putrefaction. They make no use of spices or other aromatics, either in preserving or cooking their food. Even salt is not considered as an essential, and is seldom used as an appendage in their cookery. This article is only prized by them on account of its usefulness for their horses. In regard to their choice of food, however, and manner of cooking it, the small variety within their reach, and the impracticability of obtaining condiments of different kinds, perhaps renders them less particular in these respects, than they would be under different cir-

cumstances. It cannot be supposed that they are entirely insensible to dainties of every description; on the contrary, they appear remarkably fond of sugar and saccharine fruits.

They appear to have a natural propensity for the fumes of tobacco, which they invariably inhale into the lungs, and eject through the nostrils. They make no use of this article except in smoking, which is an [256] indulgence of which they are exceedingly reluctant to be deprived. When they cannot obtain tobacco, they use as a substitute the dried leaves of the sumac, the inner bark of the red willow dried, and the leaves and bark of a few other shrubs, the fumes of which are less stimulating, but equally as palatable as those of tobacco.

The Indians under consideration know not the use or value of the precious metals, except as trinkets or ornaments for their dress. They use wampum, and in some few instances shells of a small size and of a particular character, as a substitute for money. But in general furs, peltries, horses, and various articles of dress at standing or fixed rates of barter, are the immediate objects, both of internal and external trade. They do not hold their property in common, but each individual enjoys the fruit of his own toil and industry. They are accounted more or less wealthy according to the number of horses they are possessed of, and the style in which they are able to dress.

Polygamy is common amongst them, every man being allowed to have as many wives as he can maintain. Marriages are binding upon the parties only as long as they think proper to live together, and are often contracted for a limited term particularly specified. Females,

during the periods of their catamenia, are excluded from society, and compelled even to sleep apart from their families, in small tents or lodges constructed for their use.

Dancing is common amongst them, both as a devotional exercise and an amusement. Their gestures on both occasions are similar, except that on the former they are accompanied by solemnity, and on the latter by cheerfulness; and are characterized by extraordinary uncouthness, rather than by gracefulness. No ribaldry, however, or tricks of buffoonery are practised on these occasions; on the contrary, their deportment is uniformly accordant with their [257] ideas of decorum. This exercise is invariably accompanied by singing, or a kind of chanting, in which the women, who are usually excluded from a participation in the former, perform their part. Their music consists in a succession of tones of equal intervals, accompanied by occasional elevations and depressions of the voice. The modulations with which it is variegated are by no means melodious; the voices of all the chanters move in unison, and all appear to utter the same aspirations. The same series of sounds appears to be common to the chanting of all the tribes.

The foregoing are among the most common features in the general character of the western Indians. Although in a region so extensive as that inhabited by them, and amongst so great a variety of tribes and nations, a considerable diversity of character is to be expected and admitted, yet it is believed that the traits above considered are common to the whole, as a race of barbarians. And although the shades of barbarism in which they are enveloped uniformly exclude the light of civilization, yet

it is not to be presumed that they are equally dark and malignant in all cases.

OF THE MISSISSIPPI, MISSOURI, AND OHIO RIVERS

I trust it will not be deemed improper on this occasion, to offer a few remarks upon the character of these rivers, embracing more particularly the condition of their navigation.

The causes heretofore alleged as giving occasion to a diversity of soil within the valleys of the western rivers, have an effect also in giving character to their channels or beds. For example: the banks near the mouths of the rivers, being composed of a fine unctuous and adhesive alluvion, are less liable to crumble and wash away, and constitute a more permanent barrier to resist the force of the current, than those [258] higher up, that are composed of coarser materials. In consequence, the beds of the rivers are rendered narrower and deeper towards their mouths than at greater distances above them. This is more particularly the case with the Mississippi, Red, Arkansa, and some others, whose beds or channels gradually dilate, and become more shoal on ascending from their mouths. Thus it happens also, that the navigation of the Mississippi has fewer obstructions between Natches and its mouth than above this part of the river, having so great a depth of water, that mags, bars, &c. are sunk below the reach of any kind of water-craft employed in its navigation. From Natches upward to its confluence with the Missouri, the river presents impediments that become more and more numerous and difficult to pass. Still, however, the main channel, though intricate in many places, affords a sufficient depth of water in all

stages for boats of five or six feet draft to ascend to the mouth of the Ohio. From this point to the Missouri, a distance of more than two hundred and twenty miles, the navigation is partially obstructed, during a very low stage of the water, by shoals, so that it is navigable only for boats of moderate burthen, requiring but about three feet of water. At the distance of about thirty miles above the mouth of the Ohio there are two rocky bars extending across the Mississippi, called the Big and Little Chains, which in the deepest channel across them afford no more than five or six feet of water in a low stage, and occasion a great rapidity of current. The Mississippi is usually at its lowest stage about the middle of August, the summer freshet of the Missouri having subsided previously to that time. It usually continues in this stage till it is swollen by the fall freshet of the Ohio, after which it subsides again, and remains low during the winter. The distance from New Orleans to the mouth of the Missouri is estimated at about twelve hundred miles; its current in the main channel of [259] the river is supposed to have an average velocity of three miles and three quarters per hour, in a moderate stage of the water; but when the river is high its velocity is considerably accelerated. Its water is turbid, being charged with a fine argillaceous mud, of a light colour, derived exclusively from the Missouri.

The Missouri is a very wild and turbulent river, possessing the ruder features of the Mississippi, but destitute of the gentleness characteristic of the latter in many places. The obstructions to the navigation of the Missouri, although they are of the same character with those of the Mississippi, are far more numerous and formidable than those of the latter. The channel is rendered exceed-

ingly intricate by means of sand-bars and islands, and the navigation in many places is very hazardous, on account of the multiplicity of rafts, mags, sand-bars, &c. with which the channel is beset. No part of the river is exempt from these obstructions for any considerable distance, particularly when the water is low.

As this river in connexion with some of its principal tributaries traverses a considerable variety of climates, embracing more than ten degrees of latitude, a succession of spring freshets invariably takes place, and maintains an elevated stage of water from the breaking up of winter early in March, to the middle, and sometimes the last of July, when the summer freshet, yielded by the most northerly of its tributaries, takes place. During this period there is a sufficient depth to admit boats of almost any burthen; but during the residue of the year it can hardly be called navigable, except for boats drawing no more than twenty-five or thirty inches. The river is usually blocked up with ice during the winter season. The average velocity of its current, in a middling stage of water, may be estimated at four miles and one third. In time of a high freshet it moves with an [260] accelerated velocity, equal to five or five and half miles per hour.

The Ohio river, as before hinted, differs from those just described, in the rapidity of its current, the width of its bed, the character of its channel, and in several other respects; but as its general character is well known, a few remarks in relation to it will here suffice. The obstructions to its navigation are sand-bars, some few rafts and mags, and rapids, to which the intricacy of its channel in several places may be added. During a middle and high stage of water, the obstructions entirely

disappear, and an accelerated current is the only difficulty to be encountered. The average velocity of the current, in a moderate stage of water, may be estimated at two miles and a half, and in a high stage, at three miles per hour. The season in which the navigation of the Ohio can be relied on, commences between the middle of February and first of March, and continues to the latter part of June. A fall freshet usually takes place in October or November, and the river is again navigable for a few weeks. During the rest of the year, boats of inconsiderable burthen meet with numerous obstructions in their progress from the lowness of the water, and in many places no channel can be found of sufficient depth to admit their passage. At the distance of about seventeen miles from its mouth is the first serious obstruction to its navigation, consisting of a lime-stone bar extending across the river, denominated the Big Chain. Three miles above is another of a similar description. The range of rocks, of which these appear to be a portion, seems to extend across the point of land situated between the Ohio and Mississippi, presenting itself again on the latter, at the Big and Little Chains before mentioned. The falls of the Ohio at Louisville are impassable for boats of burthen, except in the higher stages of the water. Le Turt's Falls, and [261] numerous other rapids, denominated ripples, are also impassable for boats of heavy burthen when the river is at its lowest stages. In this state the river is fordable in numberless places.

OF THE GREAT VALLEY OR BASIN OF THE MISSISSIPPI

This vast region, embracing more than twenty degrees of latitude and about thirty of longitude, although it has

been explored in various directions by men of intelligence, is yet but imperfectly known; and probably no country in the world affords a more ample or interesting field for philosophic investigation. A thorough acquaintance with its geological character would in all probability lead to the most important conclusions in forming a correct theory of the earth, while a knowledge of its vegetable and mineral productions may be conducive to the comforts and enjoyments of a large portion of the human family. All we shall presume to offer under this copious head, will be a few general remarks relative to the position and conformation of the valley, grounded almost exclusively upon the hydrography of the country, so far as it has come under our observation.

The valley is bounded on the west by the Rocky Mountains, on the east and south-east by the Alleghanies, and on the south by the Gulf of Mexico. To the northward, no precise limits can be assigned as its boundary. Although many have supposed that the waters of the Mississippi are separated from those running north-westwardly into the Pacific Ocean, and north-eastwardly into the Atlantic, by a mountainous range of country, yet, from the best information that can be had on the subject, the fact is quite otherwise. The old and almost forgotten statement of savage origin, viz. that "four of the largest rivers on the continent have their sources in the same plain," is entitled to far more [262] credit. The rivers alluded to are the Mississippi, the St. Lawrence, the Saskashawin, and the Oregon or M'Kenzie's river. Agreeably to the accounts of Colonel Dixon and others who have traversed the country situated between the Missouri and the Assinaboin, a branch of Red river of

Hudson's Bay, no elevated ridge is to be met with; but, on the contrary, tributaries to both these streams take their rise in the same champaign, and wind their way in various directions to their far distant estuaries. Judging from the maps that have been given of the country near the sources of the Mississippi, and of the region generally situated northwardly of the great lakes, as also from the accounts of various travellers who have penetrated many parts of those countries, the same remarks appear equally applicable to a large portion of the whole. The water-courses are represented as chains of lakes of various magnitudes, while lakes and stagnant pools are scattered in almost every direction, without ridges or perceptible declivities to show the direction in which they are drained. But we forbear to enlarge on this subject, and beg leave that reference may be had to Bouchette's map of the region of which we have just been treating, as a document containing ample illustrations of our opinion. Hence it will be inferred that the valley of the Mississippi is merely a portion of an immense region of valley or flat country, extending from the Gulf of Mexico north-eastwardly to the Atlantic, and north-westwardly to the Pacific Ocean.

Within the valley or region drained by the Mississippi, are situated no less than three distinct ranges of mountainous country, the localities of which we will attempt to point out. The first and most considerable is a range of mountains commencing within the Spanish province of Texas, and stretching in a north-eastward direction, till it is terminated by the high lands on the lower part of the Missouri river. To this range we have given the name of the Ozark [263] Mountains, an appellation by which the Arkansa river was formerly distinguished, as also the

tribe of Indians, since denominated the Quawpaws, inhabiting near that river. Its direction is nearly parallel to that of the Alleghanies. Its peaks and ridges are less elevated than those of the latter, and do not present the same regularity in their arrangement. The second is denominated the Black Hills, commencing on the South or Padouca fork of the river Platte, at the distance of about one hundred miles eastward of the Rocky Mountains, and stretching north-eastwardly towards the great northerly bend of the Missouri. Of this range very little is yet known; and the fact that there is such a range is partially substantiated by the concurrent testimony of the traders and hunters of the Missouri, with whom it is a noted landmark, but it is more fully corroborated by the hydrography of the country, as may be shown by the map.

The third is a range of hilly and broken country, commencing on the Wisconsan near the Portage, and extending northwardly to Lake Superior. To this range we have taken the liberty to give the name of the Wisconsan Hills. The Ocooch and Smokey Mountains before mentioned, are connected with this range. In its geological character, and more especially in its metallic productions, so far as our inquiry will enable us to decide, it appears nearly allied to the Ozark Mountains, and circumstances are not wanting to induce the opinion, that they were once the same continuous range. Dr. James is decidedly of opinion, that the metalliferous region of the Mississippi, which extends from Red river to Lake Superior in the direction of these two ranges, strongly indicates that a continuous range, as just hinted, once had an existence.

The Mississippi river may be regarded as occupying the lowest part of the valley, from its great estuary, the

Gulf of Mexico, to its confluence with the Missouri and Illinois. Thence to Lake Michigan, [264] the immediate valley of the Illinois is to be viewed as the lowest part of the great valley under consideration. This conclusion necessarily results from an attentive consideration of the characters of the three rivers just mentioned. If the inclinations of the plains down which these rivers respectively flow, be in any degree proportionate to the velocities of their currents, the plain of the Illinois will be found to have far the least inclination, inasmuch as the velocity of its current is not more than one-fourth of that of either of the others. But in order to have a more distinct view of the matter, let us assume the parallel of latitude intersecting the Illinois at its head, or point of confluence of the Kankakee and Des Plaines rivers, and suppose a vertical section cut in the direction of the parallel. Such a section would intersect the Missouri at the distance of nearly seven hundred miles from its mouth, the Mississippi at about two hundred and sixty, and the Illinois at two hundred and fifty from the same point. Hence, allowing that the plains of each have the same inclination, the point of intersection on the Missouri would be at a greater elevation than that on the Mississippi, and that on the Illinois would be less elevated than either. But the difference of inclination in these plains is manifest, not only from the comparative velocities of the several streams alluded to, but from the circumstance, that the Illinois is destitute of any considerable rapids throughout its whole course, whereas the Mississippi, in addition to a current uniformly more rapid, is hurried down the De Moyen rapids, eleven miles in length; and the Missouri, without

a perversion of terms, may be denominated a rapid throughout the distance above specified. By a similar course of reasoning it may also be made to appear, that the assumed point of intersection on the Illinois is less elevated than any other point in the same parallel of latitude between that river and Lake Erie, and even that it is somewhat lower than the surface of [265] the lake itself; for the aggregate descent, from the surface of Lake Michigan to the point under consideration, is evidently greater than from the surface of the same lake to that of Lake Erie; or, in other words, the descent of the Des Plaines, from Chicago to its confluence with the Kankakee, is greater by a few feet than that of the stream uniting Lakes Huron and Erie.

This view of the subject affords us a clue whereby to ascertain, with some degree of precision, the aggregate fall of the water, from the head of the Illinois, to the Gulf of Mexico. Agreeably to the surveys of the Great Canal of New York, the elevation of Lake Erie above tide-water is found to be 564 feet. Hence we may assume, in round numbers, 450 feet as the altitude of the head of the Illinois above the ocean.

Of the conformation of the valley in other respects, no other ideas can be advanced but such as are suggested by a general view of the topography of the country, and especially of the courses of the principal rivers, as exhibited in the map of the country drained by the Mississippi. We will only add, that the inclined plain constituting the western side of the valley, or, in other words, the great slope down which the Red, Canadian, Arkansa, Konzas, Platte, and other large rivers have their courses, has

probably a greater general inclination than any other side of the valley. In forming an estimate of the aggregate descent of this slope, commencing at tide-water, and extending to the base of the Rocky Mountains, Pike allows 8000 feet, which probably exceeds the truth by more than one-half. We would substitute 3000 feet as the aggregate elevation of the base of the mountains above the ocean, and are of opinion, that this amount rather exceeds the truth. This altitude, added to that of James's Peak as before stated, would give for the height of that Peak above the ocean, 11,500 feet; comparing this altitude with that of the "inferior [266] limit of perpetual snow," as estimated by M. De Humboldt for the latitude of 40 degrees, viz. 9846 feet above the ocean, we find the summit of the Peak 1654 feet higher than that elevation; and judging from appearances, this difference of altitude seemed sufficiently well marked by the distance to which the snow extended from the summit downward, upon the sides of the Peak, to authenticate in a good degree the calculation above stated.

The foregoing report is intended as a civil rather than a military description of the country. For a partial description of its military features, I beg leave to refer to my report of the 12th May, 1818, to Brigadier General T. A. Smith, on file in the War Department.

In the performance of topographical duties I have been aided by Lieutenants Graham and Swift, who have rendered essential service in these and other operations. The former of these gentlemen is at present occupied in completing the calculations upon the various astronomical

and other observations we took in connexion with our duties; the latter is engaged in delineating the surveys made in behalf of the expedition.

The services of Captain Bell are to be recognized as highly important and useful to the expedition, in keeping a journal of our proceedings, and conducting detached parties whenever an occasion required. He is now busily engaged in revising his journal, a copy of which will soon be in readiness to be disposed of agreeably to your instructions.

The duties in the various departments of natural science were discharged with zeal and ability by Mr. Say and Dr. James, assisted by Mr. Peale, who was active and industrious in the collection and preservation of such rare specimens of animals, &c. as came under our observation. The vessel on board of which most of these specimens were shipped [267] from New Orleans, has very lately arrived in this port, and discharged our packages in good order. I take this opportunity to express my acknowledgements of the politeness of her owners, Messrs. Price and Morgan, who have kindly franked the transportation of the collections. A catalogue, embracing the zoology of the country explored by us, is shortly expected from Mr. Say, and shall be forwarded by the earliest opportunity. Dr. James has been instructed also to furnish a mineralogical and botanical catalogue, which is daily expected. Both of these are intended as accompaniments to this report.

Mr. Seymour has taken numerous landscape views, exhibiting the characteristic features of various parts of the country, besides many others of detached scenery.

A map of the country situated between the meridian of Washington City and the Rocky Mountains, shall be reported as soon as the necessary elements and data can be compiled and the drawings executed.

I have the honour to be, Sir,
most respectfully,
Your obedient and humble Servant,
S. H. LONG,
Major U. S. Engineers.

Honourable J. C. Calhoun,
Secretary of War.

OBSERVATIONS ON THE MINERALOGY AND GEOLOGY OF A PART OF THE UNITED STATES WEST OF THE MISSISSIPPI.

Extracted from a Report to Major Long[79]

The following remarks are designed to give a summary and connected view of the facts and observations collected during the progress of the exploring expedition, relative to the geology and mineralogy of the several regions traversed by the party, more particularly of the Rocky Mountains, and the western portions of the great valley of the Mississippi. In an attempt of this kind, some difficulty arises from the unsettled and progressive condition of geognostic science. A nomenclature, constructed upon principles applicable to the other branches of natural history, has been extended to this. Attempts have been made to define classes, orders, genera, and species of rocks; while it must be acknowledged, that the inventors of systems have hitherto failed to point out such infallible foundations for distinction of character as exist in the animal and vegetable kingdoms. Among minerals, from one extreme of the series to the other, there is a constant

[79] The Report from which these observations are extracted was drawn up at Smithland, Kentucky, in January, 1820, soon after the return of the exploring party from the Rocky Mountains. Since that time, opportunities have been wanting to supply the deficiency of study and comparison, for which that place, remote from all collections of books and minerals, did not afford the means. We may be allowed to mention these circumstances in extenuation of our apparent neglect of many recent innovations in geology, and of some late works, with which we had not the opportunity to be acquainted.— James.

transition of approximating aggregates into each other. The particles of unorganized matter, being exempt from the influence of those peculiar laws which regulate the forms and characters of living [272] beings, and moving in obedience only to the impulses of attraction and affinity, arrange themselves together not always in an invariable order, and after a permanent and unalterable type, but are variously intermixed and confounded, as circumstances may have variously influenced their aggregation. Definitions, it must be acknowledged, have been constructed, strictly applicable to particular portions of matter, which may occur under similar circumstances in remote quarters of the globe. Fragments of granite may be found in the Rocky Mountains of America which could not be distinguished from the granite of Egypt, such as is seen in our collections. These definitions, then, may be sufficient for the purposes of the naturalist who confines his inquiries to his cabinet; but when examinations are extended, when we approach the imaginary limits of these artificial divisions, we not uncommonly find ourselves deserted by our boasted distinctions and definitions. It must be evident to any person in the slightest degree familiarized to the examination of the rocky materials composing the earth's surface, that between any two of the contiguous artificial divisions there is often-times no definite and discoverable boundary. Granite must consist essentially of felspar, quartz, and mica; so must gneiss and mica-slate; and between the two former, it is often extremely difficult to point out the line which shall be considered as marking the termination of the one and the commencement of the other. It will, we think, be acknowledged, that not one of the names applied to rocks, as constituting extensive

strata, conveys of itself a definite and satisfactory idea. Hence the necessity which is felt, in attempting to give a detailed account of the rock formations of any particular district, to define the names in almost every instance of their application. If the following remarks should on this account seem faulty, by a certain monotony and appearance of [273] repetition, we hope there are a few, who, for the sake of the facts detailed, will excuse any want of precision in the language which may have necessarily resulted from the unsettled condition of the nomenclature.

No part of the earth, it is probable, presents a greater degree of simplicity and uniformity in the structure and conformation of its surface than North America. The mountain ranges are here distinct, forming each its own particular system, and preserving severally, through their whole extent, a similarity in external appearance, as well as in the structure and aggregation of the various rocks of which they are composed.

The outlines of a physical delineation of the continent of North America would present, first, the great chain of the Rocky Mountains, evidently a continuation of the Andes of the southern hemisphere, stretching parallel to the direction of the western coast from the isthmus of Panama to the northern ocean. Their summits penetrating far into the regions of perpetual winter, look down upon the vast plains of the Mississippi and its tributaries; in which we distinguish a comparatively inconsiderable range of rocky hills, commencing near the confluence of the Missouri and Mississippi, and running south-west of the Gulf of Mexico, near the estuary of the Rio del Norte. Beyond these, the surface subsides to a plain, stretching eastward to the

commencement of the great chain of the Alleghanies. The range of the Alleghanies, far less elevated and alpine than that of the Rocky Mountains, traverses the continent in a direction nearly parallel to the Atlantic ocean, from the Gulf of St. Lawrence, on the north-east, to the confluence of the Alabama and Tombigbee rivers, in the south-west. Compared to the Rocky Mountains, this range is without summits, presenting, instead of conic peaks, long and level ridges, rising in no point to the inferior limit of perpetual frost, and scarce in any instance reaching that degree of [274] elevation which is incompatible with the growth of forests.

In many particulars there is a manifest resemblance between the Alleghanies, and the comparatively inconsiderable group known by the name of the Ozark mountains. They are parallel in direction, making an angle of about forty degrees with the great range of the Andes. They agree in having their most elevated portions made up of rocks of recent formation. It is well known, that, from the highly primitive gneiss rock at Philadelphia, there is a gradual ascent, across strata more and more recent, to the rocks of the coal formation, about the summit of the Alleghanies. Whether the same thing happens in every part of the range, our examinations have not yet been extensive enough to decide. We know that some of the granitic mountains of New England are far surpassed in elevation by the neighbouring hills and ridges of mica slate, talcose rocks, or even more recent aggregates.

In the Ozark mountains, as far as they have been hitherto explored, the granites and more ancient rocks are found at the lowest parts, being surmounted by those of a more recent date, the newest horizontal sandstone,

and strata of compact limestone, forming the highest summits. What we wish to remark is, that the reverse of this being the case with the Rocky Mountains, the granite there far surpassing, both in extent and elevation, all the other aggregates forming the central and higher portions of all the ridges, that range has a character very distinct from the Ozark or Alleghany mountains.

It has been suggested by Major Long, that the hydrography of the upper portion of the Missouri seems to indicate the existence of a mountain range, approaching that river from the south-west, near the great northern bend, in the country of the Mandans. From Lewis and Clarke we have also some accounts tending to the confirmation of this opinion. Further [275] examination may perhaps prove this third range, called the Black hills, to resemble in direction and general character the Alleghany and Ozark mountains. The Rocky Mountains have not inaptly been called the backbone of the continent: these three lateral ranges, going off at an angle of about forty degrees, may with equal propriety be called the ribs. In latitude 38° north, the eastern base of the Rocky Mountains is found to be in about 106° west longitude: following the same parallel of latitude eastward, you arrive at the base of the Ozark mountains, nearly in longitude 94°. The intervening space, occupying the extent of near twelve degrees of longitude, is a wide and desolate plain, destitute of timber; scorched in summer by the reverberation of the rays of the sun, howled over in winter by the frozen west winds from the Rocky Mountains.

Though we have assumed twelve degrees of longitude as the medium width of this great plain, it is to be re-

marked, that to many parts of it our examinations have not been extended. In the latitude of 41°, no mountain, and scarce an elevation deserving the name of a hill, occurs between the western range of the Alleghanies and the Rocky Mountains. But at no great distance north of this parallel, low ranges of hills begin to appear in the region south-west of Lake Michigan; and though too inconsiderable in point of elevation to deserve particular notice, still they exhibit peculiar characters, which seem to designate an intimate connection with the Ozark mountains, south of the Missouri. The same succession of strata, the same alternation of crystalline beds, with those of mechanical deposition, and similar depositories of metallic ores, are observed here, as in the regions about the Merameg and St. Francis. A marked difference is also, as we think, to be discovered between the rocks and soils on the different sides of this range. Of this we shall speak more [276] particularly in another place. For our present purpose, it is sufficient to assume as a boundary of the region we propose first to consider, a line running from the confluence of the Arkansa and Canadian rivers on the south-west, to the junction of the Mississippi and Wisconsan, on the north-east. Assuming this as the direction of the range of the Ozark mountains, it will be perceived, by examining the map, that to the north-west of this line spreads an extensive plain, reaching to the base of the Rocky Mountains. This plain has been crossed in three different places by the exploring party, as already detailed in our narrative; once in ascending by the River Platte, between latitude 40° and 41° 30′; again, in descending the Arkansa, in 38°; and, thirdly, by the route of the Canadian, in 34°. To the information collected in these journeys, we have

added a little from other sources; but the greater part of this extensive region yet remains unknown.

Of the Great Desert at the base of the Rocky Mountains

The portion of country which we design to consider under this division has an average width of five or six hundred miles, extending along the base of the Rocky Mountains from north to south: as far as we have any acquaintance with that range, consisting entirely of granitic sands, or of secondary aggregates made up of the *detritus* of that great chain of primitive mountains, there seems to be a degree of propriety in designating it by some name recognising relation to those mountains. It has been mentioned as the "Mexican desert;" a name sufficiently applicable, perhaps, to some portions of it, but one by no means to be extended to every part alike, as there can be little doubt of its occupying an extensive [277] portion of the interior of North America. That a similar desert region exists on the western side of the mountains, we have sufficient evidence; but whether as uninterrupted and as extensive, we have not the means of determining.

The Jesuit Venegas, speaking of the early history of California, says "Father Kino and his companions, after travelling thirty leagues from San. Marcelo, came to a small rancheria (Indian village); and leaving on the north the great mountain of Santa Clara, whose sides, for the length of a league, are covered with pumice-stone, they arrived at the *Sandy Waste*, on the 19th of March." Our information is, however, too limited to justify an attempt to fix the boundaries of this desert; we will, therefore, content ourselves with communicating the observations our opportunities have enabled us to make.

The channel of the Missouri, near the mouth of the Platte, discloses here and there rocks of horizontal limestone; which, from their peculiar character, we are disposed to consider as belonging rather to the Ozarks, than having any connection with the Rocky Mountains. These rocks appear at the lowest parts of the valleys, and are usually surmounted by extensive beds of soil, consisting principally of flinty sand in the most minute state of division, but variously intermixed with the remains of organized beings, and sometimes with calcareous and aluminous earth. Proceeding westward, the sand becomes deeper and more unmixed; not a rock or a stone, in place or out of place, is to be met with for some hundreds of miles. It is believed that no rocky bluffs appear along the valley of the Platte, within three hundred miles of its mouth, though a small part of this distance, on the lower portion of the river, has not hitherto been explored. The surface is not an absolute plain, but is varied with gentle undulations, such [278] as the draining of water, from an immense table of a light arenaceous earth, for a succession of centuries, may be supposed to have occasioned. The gradual intermixture of the exuviæ of animals and vegetables, with what was formerly a pure siliceous sand, has at length produced a soil capable of supporting a scanty growth of grasses; now almost the only covering of these desolate regions. Scales of mica, little particles of brownish felspar, and minute fragments of hornblende, may here be detected in the soil.

About four hundred miles west of the mouth of the Platte, a low range of sandstone hills crosses the country from south-west to north-east. The strata composing these hills have no perceptible inclination, and present ap-

pearances which indicate their deposition to have been nearly contemporaneous to that of many of our coal formations. It has already been suggested that this range may probably be a continuation of the Cotes Noir, or Black hills, said to contain the sources of the Shienne, the Little Missouri, and some branches of the Yellow Stone."[80]

These inconsiderable hills being passed, the surface again subsides nearly to a plain. The fine and comparatively fertile sand which prevailed to the east of the ranges, is exchanged for a gravel made up of rounded granitic fragments, varying in dimensions from the size of a six-pound shot to finish sand. This great mass of granitic fragments, evidently brought down by the agency of water from the sides and summits of the Andes, slopes gradually from their base, appearing, as far as examinations have extended, to correspond in some measure, in magnitude, to the elevation and extent of that part of the mountains opposite which it is placed. The minute particles derived from the quartzy portions of the primitive aggregates, being least liable to decomposition, have been carried to the greatest distance, [279] and now form the almost unmixed soil of the eastern margin of the great sandy desert. The central portions are of a coarser sand, with which some particles of felspar and mica are intermixed: nearer the mountains, pebbles and boulders become frequent, and at length almost cover the surface of the country.

The opinion above advanced, that the great sandy desert has resulted from the wearing down of the mountains, both before and since the retiring of the ocean, should, perhaps, be received with some caution. We

[80] Lewis and Clarke's History, vol. i. p. 83. Philadelphia, 1814.— JAMES.

have no foundation for the belief, but in the examinations which enabled us to discover that the materials composing both regions are similar in kind; that the granitic soils of the plain are precisely such as would result from the disintegration of the rocks now existing in the mountains; and that the numerous deep ravines and water-worn valleys traversing the mountains in various directions, indicate the change here supposed to have happened.

It is probable many parts of this extensive desert may differ from that traversed by the Platte, in having the surface more or less covered with horizontal strata of sandstone and conglomerate, instead of loose sand and pebbles. Indeed, there are many appearances indicating that a formation of this kind formerly extended down the Platte much farther than at present. From the minute account given in the narrative of the expedition, of the particular features of this region, it will be perceived that its eastern portions bear a manifest resemblance to the deserts of Siberia. The soils, and I believe the rocks, wherever any occur, are saline: plants allied to chenopodium and salsola are peculiarly abundant, as are the astragali and other herbaceous leguminæ; while trees and forests are almost unknown.

The surface of the sandy plain rises perceptibly towards the base of the mountains; and becoming constantly more and more undulating, is at length broken, disclosing some cliffs and ledges of micaceous [280] sandstone. Near the Platte this sandstone occurs in horizontal strata, sometimes divided by the beds of the streams, and forming low ridges parallel to the Rocky Mountains. Whether they continue in an uninterrupted line along the base of the mountains, we have not been able to ascertain. They

are separated from the first range of primitive, by more elevated cliffs of a similar sandstone, having its strata in a highly inclined position. Behind these, occur lofty but uninterrupted ranges of naked rocks, destitute of any covering of earthy or vegetable matter, and standing nearly perpendicular. At a distant view, they present to the eye the forms of walls, towers, pyramids, and columns, seeming rather the effects of the most laborious efforts of art, than the productions of nature. When surveyed from the more elevated summits of the first granitic range, these immense strata of sandstone standing on edge, and sometimes inclining at various angles towards the primitive, resemble the plates of ice often seen thrown into a vertical position in the eddies and along the banks of rivers.

Climbing to the summits of such of these elevations as are accessible, and crossing their stratifications towards the primitive, we observe appearances similar to those found in the valleys, when circumstances enable us to push our inquiries to a corresponding extent below the surface. Having crossed the upturned margin of the whole secondary formation which occupies the plain, and arriving at the primitive, we find these highly inclined strata of sandstone reposing immediately against the granite. We search in vain for any traces of those rocks distinguished by the Wernerians as rocks of the transition period. We also observe an entire deficiency of all those primitive strata which the doctrine of universal formations may have taught us to look for in approaching the granite.

The sandstone along the base of the mountains, [281] though apparently not very recent, contains the remains of marine animals and plants, and embraces some exten-

sive beds of puddingstone. It may be remarked that the sand and gravel composing these aggregates have in general the same close resemblance to the materials of the granitic mountains, as we have already observed in the uncemented materials of the plain. Indeed, it does not seem easy to determine whether the sands, gravel-stones, and pebbles, now loosely strewed over the extensive plains of the desert, have been brought down immediately from the granitic mountains whence they were originally derived, or have resulted from the disintegration of the stratified sandstone and conglomerates deposited during a long series of ages, while the waters of the ocean rested upon the great plain, and washed the bases of the Rocky Mountains. The very wide and equal distribution of these sands, in other words, the very gradual slope of the *débris* of the mountain, would seem to countenance the latter supposition.

The position of the strata of sandstone varies in the distance of a few miles from nearly horizontal to an inclination of more than sixty degrees, and that without any very manifest change of character, or the interposition of any other stratum. The laminæ most distant from the primitive, occupying the eastern sides of the first elevations, though lowest in actual elevation, may with propriety be considered the uppermost, as resting on those beyond. At the level of the surface of the great plain, they sink beneath the alluvial; and in the neighbourhood of the river Platte, they are no more seen. The uppermost are of a yellowish-gray colour; moderately fine; compact and hard; constantly varying, however, at different points, in colour as well as most other characters. The light-coloured varieties usually contain small round

masses about the size of a musket-ball, which are more friable than the rock itself, [282] from which they are easily detached, leaving cavities corresponding to their own shape and dimensions. They are commonly of a dark-brown colour, and of a coarser sand than that which constitutes the rock itself. Where these are found, I could never discover any of those remains of shellfish so distinctly seen in many of the secondary rocks in this neighbourhood.

Passing downwards, or in other words, proceeding towards the primitive, crossing the edge of the secondary, the sandstone becomes more coarse and friable, its colour inclining more to several shades of brown and red. This variety contains numerous masses of iron ore, and does not appear to abound in the remains or impressions of organized beings. It is also less distinctly stratified than that just mentioned; and it often becomes exceedingly coarse, with angular fragments intermixed, being in no respect different from the rock denominated breccia, and by some geologists considered a distinct stratum.

This tract of sandstone, which skirts the eastern boundary of the Rocky Mountains, and appears to belong to that immense secondary formation which occupies the valley of the Mississippi, abounds in scenery of a grand and interesting character. The angle of inclination of the strata often approaches 90°, and is very rarely less than 45°. That side of the ridges next the primitive appears to have been broken off from a part of the stratum beyond; and is usually an abrupt and perpendicular precipice, sometimes even overhanging and sheltering a considerable extent of surface. The face of the stratum is usually smooth and hard, and both sides are alike desti-

tute of soil and verdure. Elevations of this description are met with, varying from twenty to several thousand feet in thickness; neither are they by any means uniform in height. Some of them rise, probably, three hundred or four hundred feet; and considering their singular character, would appear [283] high, were they not subjected to an immediate and disadvantageous comparison with the stupendous Andes, at whose feet they are placed. Their summits in some instances are regular and horizontal, and are crowned with a scanty growth of cedar and pine. Where the cement and most of the materials of the sandstone are siliceous, the rock evinces a tendency to break into fragments of a rhombic form; and in this case the elevated edge presents an irregularly notched or serrated surface.

Sandstones consisting of silex, with the least intermixture of foreign ingredients, are the most durable. But in the region of which we speak, the variations in the composition, cement, and characters of the sandstone, are innumerable. Clay and oxide of iron entering into its composition in certain proportions, seem to render it unfit to withstand the attacks of the various agents, whose effect is to hasten dissolution and decay. Highly elevated rocks of this description may well be supposed in a state of rapid and perceptible change. The sharp angles and asperities of surface which they may have originally presented, are soon worn away; the matter constantly removed by the agency of water from their sides and summits is deposited at their feet; their elevation gradually diminishes, and even the inclination of their strata becomes at length obscure or wholly undiscoverable. This appears to have been a part of the process by which numer-

ous conic hills and mounds have been interspersed among the highly inclined naked rocks above mentioned. These hills, often clothed with considerable verdure to their summits, add greatly to the beauty of the surrounding scenery. The contrast of colours in this rude but majestic region, is often seen to produce the most brilliant and grateful effects. The deep green of the small and almost procumbent cedars and junipers, with the less intense colours of various species of deciduous foliage, acquires new beauty from being [284] placed as a margin to the glowing red and yellow seen in the surfaces of many of the rocks.

Of the Sandstones of the Rocky Mountains

Having commenced our account of the Rocky Mountains with the consideration of that vast accumulation of rounded fragments constituting the Great Desert, which may be reckoned the most recent formation connected with that great range of mountains, we proceed to speak of the sandstones, the next member in the inverted order we have adopted; and here we take occasion to remark the peculiar grandeur and simplicity of features which distinguish the mineral geography of this part of our continent. We have here a stupendous chain of granitic mountains, many hundred miles in extent, and with no stratified rocks resting about their sides, except a few sandstones, equally granitic, and almost equally primitive. We discover here comparatively few traces of that magnificent profusion of animal and vegetable life, which in other parts of the globe has reared mountains of limestone, clay-slate, and those other aggregates, which if not entirely, are often in a great measure, made up of the exuviæ

of living beings. We shall not here be understood to contradict the assertion we have before made, that the sandstones along the base of the Rocky Mountains contain organized remains, and bear abundant evidence of having been at a comparatively recent period deposited gradually from the waters of the ocean. The particular we wish to remark as distinguishing these mountains most strikingly from the Alleghanies, and many other ranges, is the entire want of the aggregates referred by the Wernerians to the transition period, as well as nearly all the stratified primitive rocks, and the limestones of the secondary formations.[81] This great range, as far as hitherto known to us, lies nearly from north to south. Considered [285] topographically, the sandstone formation belongs both to the mountains and the plains, sloping down from the sides of the granite, and disappearing under the sands of the Great Desert.

The western boundary of this formation of sandstone, as far as our examinations have searched, appears to be defined, and corresponds to the side of the easternmost granitic ranges. From the Platte towards the south, the

[81] What explanation the advocates for the doctrine of the recent *emersion* of our continent will give of the highly and exclusively primitive character of the Rocky Mountains, we are at a loss to conjecture. The organized remains hitherto observed in the secondary aggregates along the base of those mountains, are mostly of animals supposed to have inhabited the depths of the ocean. But if the granite of the Rocky Mountains has been *forced up* at a recent period, where are the traces of all those older secondary, and fletz rocks, which should have intervened between it and the horizontal sandstones? If these mountains had formed the shores of that ocean, in which the greater part of our continent was so long immersed, after the elevation of the *old world*, we should have expected to find along their base, the remains of littoral animals, and not of those which inhabited the depths of the ocean. It would be proper, however, before we refer to the character of the Rocky Mountains, as invalidating or confirming any system of opinions, to ascertain that their eastern and western sides are in all respects similar.— JAMES.

sandstone increases in width, and on the Canadian it extends more than half the distance from the sources of that river to its confluence with the Arkansa. This sandstone formation we consider as consisting essentially of two members.

1st. *Red sandstone.*— This rock, which is the lowest of the horizontal or fletz rocks met with in this part of the country, is very abundant in all the region immediately subjacent to the Rocky Mountains. We have never met with a similar rock in the eastern part of the valley of the Mississippi. It occurs at intervals along the base of the mountain, reposing against the primitive rocks, in an erect or highly inclined position. It varies in colour from bright brick red, to dark brown; and is sometimes found exhibiting various shades of yellow and gray. It is, however, almost invariably ferruginous; and the predominance of red in the colouring certainly entitles it to the distinctive appellation of red sandstone. The lowest part of the stratum has frequently least colour, and is also the most compact and hard. This is not, however, invariably the case; for in the neighbourhood of the Platte, that part of it which lies immediately upon the granite is white, and contains beds of coarse conglomerate or puddingstone. At the lowest points we have been able to examine, are found embodied large oval or irregular masses of hornstone, usually of a yellowish-white, or bluish colour; and near the surface of these masses are found the few well-marked organic relics the stratum can be said to contain. Higher [286] up the rock becomes much softer, and usually of a browner colour. It is disposed in immense horizontal laminæ or strata, which, when broken transversely, exhibit some tendency to

separate into fragments of a rhombic form. Near the upper part of the stratum are frequently seen broad belts of a lighter colour, conspicuously marked with reticulating yellowish veins. The cross fracture of the stone is even and earthy, except in the conservatories. When divided in a direction parallel to that of the strata, small scales of mica are seen; but this is usual only in those parts of the stone where natural seams or fissures existed. Small specimens from many parts of this stratum could not be distinguished from the red sandstone quarried at Nyae in New Jersey, and used in great quantities in the cities of New York, Albany, &c. for building. The character which most particularly distinguishes this rock from "the old red sandstone of Werner," pointed out by Maclure in New York and New Jersey, appears to be the constant accompaniment of gypsum, and muriate of soda; the colour of the stratum is also in general of a brighter red, approaching vermilion, and is more copiously imparted to such streams of water as traverse it.

2d. *Argillaceous or gray sandstone.*— Immediately above the red sandstone, we have invariably found, where any rock rests upon it, a grayish or yellowish-white sandstone, which we distinguish as the second variety. It most frequently contains a large proportion of argillaceous earth in the cement, and has a more or less slaty structure. Hence it may with propriety be denominated argillaceous sandstone, though it may in some respects differ from the rock known to many by that name. This variety being uppermost in actual position, is perhaps more frequently seen than the other, while at the same time it is probably less abundant. The line of separation betwixt the two is often manifest and well defined; and in other instances,

they pass by imperceptible gradations into each other. [287] The upper, or gray sandstone, is usually more compact and homogenous than the red; it breaks like the other, though more rarely, into large cubic or rhombic masses, which, on account of the more compact texture of the stone, retain their form longer than those of the other variety. The precipices formed by both are often lofty and perpendicular; but the projections and angles of the red are more worn and rounded than those of the gray. The narrow defiles and ravines which the streams of water have excavated, are less tortuous when they are made entirely in the gray sandstone, than in other instances. The springs of water flowing from it are more free of mineral impregnations, than such as are found in the other variety. It sometimes consists of glittering crystalline particles, but does not in this case appear to be a chymical deposit. In fine, it appears under an endless variety of characters, of which it would be in vain to attempt the enumeration. Although the gray sandstone is not invariably distinguished by the presence of an argillaceous ingredient, yet it is constantly found accompanying soft clay-slate, or bituminous shale and coal, wherever these last are met with.

If this formation of sandstone, consisting of the two varieties just mentioned, ever extended across the valley of the Mississippi to the Alleghany mountains, as some might be disposed to believe, we cannot pretend to determine what was its position relative to the immense masses of fletz, limestone, and other rocks now found in that valley. But as the red variety is still extensively disseminated, and usually accompanied by those valuable substances, salt and plaister, it may not be amiss to trace, as

far as our examinations have enabled us to do it, the outline of the region which it occupies. As we have before mentioned, it is found in the vicinity of the river Platte, in a highly inclined position, covering a narrow margin immediately at the foot of the Rocky Mountains. [288] From the accounts of Lewis and Clarke, we are induced to believe that it exists under similar circumstances, near the falls of the Missouri. On the Canadian it is constantly met with, from the sources of that river on the borders of New Mexico, near Santa Fé, 106° west, until you arrive within a short distance of its confluence with the Arkansa, in long. 97° west. The waters of the Canadian, from flowing over the sandstone in question, acquire an intense red colour, and are so impregnated with muriate of soda and other soluble salts as to be unfit for use. This, we are credibly informed, is also the case with the waters of three small rivers tributary to the Arkansa, above the Canadian, on the same side; also with the waters of Red river. Hence the conclusion appears to be justified, that this rock extends from near the Arkansa on the north, to a point beyond Red river on the south; and from near the mouth of the Canadian, an unknown distance to the west. It is not unlikely it may exist about the sources and upper branches of the Rio Colorado of California, the Red river of Santa Fé, and the other Red rivers of New Mexico. Near the mountains, and for a great distance to the south and east of the High Peak, it is covered by the gray sandstone already mentioned. This gray sandstone is the uppermost of those horizontally stratified rocks which are seen in this region, possessing convincing evidence of their being the deposition of an ocean or lake of salt water.

Perhaps the most striking feature of this formation of sandstone, is the great and abrupt change in the inclination of the strata in the parts near the granite. We have already described this in a manner sufficiently explicit, as we suppose, to convince most of our readers that since the deposition of the sandstones, a signal change must have happened in the elevation of the secondary aggregates as compared with the granite. The appearances are precisely [289] such as we must suppose would have ensued, had the sudden emerging of the granite broken off, and thrown into an inclined or vertical position the margin of the horizontally stratified rocks of the plains. We are conscious that inclined strata of sandstone are by no means infrequent about the declivities of lofty mountains, but we are not well assured that the same strata being traced to a little distance, are often found in a horizontal position in the plains, as is the case in the instance under consideration.

It may perhaps be thought possible that the gradual wearing away, by the agency of rivers, of some portions of the sandstone, may have been sufficiently extensive to have occasioned that change of elevation of which we speak; and that those rocks now found in an inclined position, are insulated portions of what was formerly the upper part of the stratum, which having been undermined on their eastern side, and supported by the granite on their western, have fallen into their present situation.

This supposition, however, seems incompatible with the vast magnitude and extent of these rocks, and entirely irreconcilable to the fact that they dip to a great and indefinite extent below the present level of any of the beds of the river.

The position of this formation in relation to the granite

is similar to that of the sandstone of Guachaco, in South America, observed by Humboldt; also to that spoken of by Mr. Burkhardt, at the entrance of Nubia, superimposed upon the granite of Syene, and to that mentioned by Mr. Schoolcraft, as found near Lake Superior, but it does not appear that those formations have the same peculiarities in regard to inclination.

FLETZ TRAP ROCKS

Another family of rocks, of recent formation, and connected with the sandstone last mentioned, remains to be noticed.

[290] These are rocks of basaltic conformation, belonging to the class, by some mineralogists denominated superincumbent rocks, and by many considered of volcanic origin. They present a striking contrast, by their dark colour, by the vastness and irregularity of their masses, to the smooth, light, and fissile sandstone on which they rest. Sometimes they are observed compact and apparently homogeneous in their composition, and in many particulars of structure, form, hardness, &c. seeming more analogous to the primitive rocks than to those recent secondary aggregates with which they are associated. In other instances, black and formless masses of porous and amygdaloidal substances are seen scattered about the plains or heaped in conic masses, but having no immediate connection with the strata on which they rest. Most of the rocks belonging to this class were observed in the neighbourhood of the sources of the Canadian. Among them we distinguish two kinds, referable to the two divisions called greenstone and amygdaloid.

1. *Greenstone*, JAMESON.— It appears in the limited district we examined under almost every variety of form and character noticed by mineralogists. Sometimes it is nearly or quite free from any intermixture of hornblende, is of a fine dark green colour, and closely resembles some varieties of serpentine. Sometimes its colour is a dull gray, graduating into brown and black of various shades and intensities. It forms numerous conic hills of considerable elevation, scattered without order, or grouped in various directions. These hills are usually of a regular and beautiful form. The great plain on which they are based is elevated and destitute of timber or water, but ornamented with a carpet of thick and verdant grasses. The hills, though steep and high, are sometimes smooth and green to the summit, the surface on all sides being unbroken by trees or rocks, and covered with thick turf. The whole forms a scene of singular [291] beauty. During our journey across the district, based upon the rocks now under consideration, we had constantly occasion to admire the freshness and abundance of the grasses and other herbaceous plants. The plains of the Platte and Arkansa we had seen brown and desolate, as if recently ravaged by fire; but here we passed elevated tracts, where, for many miles, we could find no water for our own necessities, yet the vegetation possessed the freshness of spring in the most fertile regions. But the conic hills just mentioned, are not invariably the form under which the greenstone appears. It sometimes rises in low irregular ridges, extending a considerable distance, and sloping on both sides into the level of the plain.

In the narrow channels which the streams of water have sunk in it, may be seen perpendicular precipices of great

elevation, but the valley between them is usually almost filled with large broken masses of the rock, which frequently exhibit a prismatic form. It falls readily into large masses, but seems strongly to resist that progress of disintegration which it must undergo before it can be removed by the water. The face of the perpendicular precipices are almost invariably marked by distinct and large seams running nearly parallel to each other, and at right angles with the horizon. Following the watercourses, which are sunk considerable distance below the surface, the line of separation from the sandstone on which the greenstone rests, at length becomes visible on account of the descent of the surface.

2. *Amygdaloid*, KIRWAN, JAMESON.— We apply this name to a porous or vesicular rock, of a very dark gray, greenish or black colour, usually found near the greenstone, but sometimes in connection with the sandstone. In its ultimate composition it resembles greenstone, but we have never seen in it such large fragments of felspar and scales of mica, as are observed in that rock. The amygdaloidal [292] cavities which every where penetrate this rock, are of various sizes, some of them appearing like bubbles which have been formed in a semifluid mass, and afterwards lengthened and variously distorted by the motions of the contiguous matter. Near the surface they contain a soft white, or yellowish white substance, very different from the rock itself, usually a soft chalk-like carbonate of lime. This gives the recent surface a mottled appearance. In surfaces which have been for some time exposed to the air, this soft substance has been removed, and the pores and vesicles are found empty.

Amygdaloid does not appear to occupy any very great

extent of the country near the Rocky Mountains. We have not met with it imbedded in, or surmounted by any other rock. Like the greenstone, it forms conic hills which sometimes occur in deep water-worn vallies, bounded on both sides by perpendicular walls of sandstone. It is likewise seen in the high plains, sometimes in the form of narrow and crooked ridges, apparently following what were anciently the beds of small brooks. Some very high and sharp conic hills were visible to the westward, but at a great distance. Two of this kind which stand near each other, and seem to be detached from the primitive mountains, are called the Spanish peaks, and at the end of July, snow was still to be seen on them.

When either of the two rocks last mentioned occur, it is not uncommon to find detached masses of a stone somewhat resembling the pumice-stone of commerce. It is usually of a faint red, or yellowish white colour, but sometimes it is brown, or nearly black. It feels less harsh than the pumice-stone which is used in the arts, and seems to consist in a great degree of clay. It appears to be entirely similar to the substance brought down the Missouri by the annual floods, and by many considered as a [293] product of pseudo-volcanic fires, said to exist on that river.

With regard to the soils resting upon the rocks of this trap formation, it may be worthy of remark, that gravel and water-worn pebbles rarely occur, except in situations where it is easy to see they may have been derived from the substratum of sandstone. We are not disposed to enter into any discussion concerning the origin of the trap rocks. The volcanists, and those who believe the

trap formations to have been thrown up in a state of fusion from beneath the crust of the earth, will have an easy method of accounting for a fact mentioned in our journal, namely, that pieces of charred wood were found enclosed in the sandstone underlying the formation in question. Though we sought in vain for some evidence that the rocks of this formation traversed the strata of sandstone in the manner of the whin dikes of England, we are conscious our examinations were far too limited to justify us in asserting that this is not the case; nor can we adduce a single fact from which it could be inferred that these basaltiform rocks have been deposited, like the accompanying strata of sandstone, from suspension in water. The country occupied by this formation, exhibits scenery of a very peculiar and interesting character. It is remarked by Humboldt,[82] that "in the Canary islands, in the mountains of Auvergne, in the Mittelgebirge in Bohemia, in Mexico, and on the banks of the Ganges," and we may add, in the United States, the formation of trap is indicated by a symmetrical disposition of the mountains by truncated cones, sometimes insulated, sometimes grouped, and by elevated plains, both extremities of which are crowned by a conical rising. In some of the unpublished drawings by Mr. Seymour, these peculiar [294] features of the scenery of the fletz trap formation, have been preserved.

RECAPITULATION

The secondary formations along the eastern base of the Rocky Mountains, are:

1st. *Red Sandstone* — Rests immediately upon the

[82] Personal Narrative, vol. i. p. 87. American edition.— JAMES.

granite, is rather indistinctly stratified; strata sometimes inclined and sometimes horizontal; abounds in gypsum, salt, and iron, but exhibits no indications of coal.

2d. *Argillaceous*, or *Gray Sandstone* — Overlays the red, conforming to it in the inclination of the strata, occurs principally near the primitive; contains coal and iron.

3d. *Greenstone* and *Graystone*[83]— Of an imperfectly columnar structure, resting on the argillaceous sandstone.

4th. *Amygdaloid* — Sometimes containing argil, and sometimes hornblende, occurs with the greenstone about the sources of the Canadian river, constituting with the former the newest fletz trap formation.

5th. *Sand* and *Gravel* — Accompanying the sandstones and extending over the great desert, but rarely found resting on the trap rocks.

The sandstones being entirely mechanical aggregates, consisting of rounded fragments of rocks formerly constituting a part of the primitive mountains, would seem to have been deposited at a very remote period, when the waters of the primeval ocean covered the level of the great plain and the lower regions of the granitic mountains.

Subsequent to the deposition of the horizontally stratified rocks, the position of these in relation to the primitive, has been somewhat changed either by the action of some force beneath the primitive rocks, [295] forcing them up to a greater elevation than they formerly possessed, or by the sinking down of the secondary, produced by the operation of some cause equally unknown. Without supposing some change of this kind, how can we account for the great inclination of the margin of the sandstone rocks which is found resting against the granite almost

[83] Pinkerton.— JAMES.

perpendicularly? Nearly contemporaneous to this change, was the retiring of the sea, and the formation of the trap rocks. The beds of loose sand and gravel which are still constantly accumulating, have been formed in part from the disintegration of the sandstones and puddings, and partly by the action of those currents of water which are constantly bringing down small fragments from the primitive rocks, and depositing them in the plains.

The absence of any formation of limestone is a distinguishing characteristic of the country under consideration. A traveller to the upper part of the Missouri mentions "calcareous and petrosiliceous hills," as existing in the coal districts on that river. But in ascending the Platte from its confluence with the Missouri to the mountains, we saw not a single fragment of limestone. Small veins of carbonate of lime crystallized in the usual form, are met with in the argillaceous sandstone of the Arkansa, also the sulphate in small quantities. Gypsum is very abundant on the Canadian river, at a distance of three or four hundred miles from the mountains. It is disseminated in veins and thick horizontal beds in the red sandstone. The extent and thickness of these horizontal beds are, perhaps, such as would justify the appellation of stratum, but as it is not met with in great quantities, except in connection with the sandstone, with which it often alternates, it may with propriety be considered a subordinate rock.

Rock Salt.— This substance has often been said to exist in some part of upper Louisiana, in the form of [296] an extensive stratum: we have met with salt among the natives in masses of twenty or thirty pounds weight. The interior of these masses when broken, presented a crys-

talline structure, being made up of incomplete cubic crystals variously grouped together. On one of the surfaces, which had probably been the one in contact with the ground or rock on which the salt had rested, a considerable mixture of red sand was discoverable. These masses had apparently been produced by the evaporation, during the dry season, of the waters of some small lake. The whole country near the mountains abounds in licks, brine springs, and saline efflorescences, but it is in the neighbourhood of the red sand-rock before mentioned, that salt is met with in the greatest abundance and purity. The immediate valley of the Canadian river in the upper part of its course, varies in width from a few rods to three or four miles, but it is almost invariably bounded by precipices of red sand-rock, forming "the river bluffs." In the valley between these, incrustations of nearly pure salt are often found, covering the surface to a great extent, in the manner of thin ice, and causing it to appear when seen from a distance, as if covered with snow.

Most of the remarkable formations of rock-salt hitherto known, have been found in the stratum denominated "the lowest red sand rock, which appears to correspond in character, position, &c. with the sandstone above mentioned. Rock salt is found in connection with this sandstone in Cheshire, and at Northwich and Droitwich, in England, at Cardona in the province of Catalonia in Spain, and at the base of the Carpathian mountains in Moldavia and Poland. In Peru it is accompanied by sandstone and gypsum.

Accident, or further examination, it is probable, may hereafter bring to light those extensive beds of [297] this substance, which there is reason to believe exist

in the neighbourhood of the Rocky Mountains. The briny character of those great streams, the Arkansa and Red rivers, flowing over the red sandstone formation, and receiving from it the peculiar character and colour of their waters, affords sufficient evidence of the existence of such beds, and the greatness of the quantity washed away in any given time, would lead to the conclusion, that they must be of vast extent. By the analogy of other rock salt formations apparently similar in character, we should be instructed to search for these beds in depressed situations and basin-shaped cavities, whose contents had not been worn down and removed by the currents of water.

Other secondary rocks found in different parts of the great valley of the Mississippi will be noticed hereafter. Those above enumerated seem to have a peculiar dependence upon the Rocky Mountains, and for this reason, we thought proper to consider them in connection with that range; they also appear to be, in some measure, independent of the other members of that great secondary formation on the borders of which they occur. The peculiar features of the region occupied by these rocks have been minutely described in the narrative of our journey. It is a region unfitted by the barrenness of its soil, the inhospitable character of its climate and other physical disadvantages, to become the residence of a permanent and numerous population. The immense grassy plains of the southern and eastern portions are adapted to the feeding of cattle and horses; and it is not improbable the countless herds of bisons and wild horses will soon give place to domesticated animals. The coal, salt, plaster, and iron, which constitute the mineral wealth of this por-

tion of the United States' territory, lose much of their value on account of their remoteness from navigable streams. Beautiful carnelions and agates occur in the alluvial regions of [298] the Platte and the Missouri; but these will never become objects of any importance.

Of the Ozark Mountains

Leaving the newest fletz trap rocks, about the sources of the Canadian, and returning eastward along the great woodless plain between the Arkansa and Red rivers, we find an extensive tract occupied exclusively by the red sandstone of the salt formation. This rock, as we have already remarked, is constantly accompanied by gypsum and muriate of soda. The red and somewhat argillaceous soil which results from its disintegration is far more fertile than that of the gravelly plains of the Platte, being often covered with a luxuriant growth of grasses, and affording pasturage to great numbers of herbivorous animals.

About one hundred and fifty miles west from the confluence of the Arkansa and Canadian, this red sandstone is discontinued, being succeeded, or perhaps overlaid by an extensive coal formation. The argillaceous sandstone of this formation assumes various characters at different points. The Falls of the Canadian, particularly described in our narrative, are occasioned by a small ridge of fine argillaceous sandstone of a deep green colour, crossing the bed of the river obliquely. The coal beds in this region are of great thickness, and are apparently extensive and numerous. This formation appears, in a great measure, unconnected with the coal strata along the base of the Rocky Mountains, and the sandstone

of the two districts are often remarkably dissimilar. Though the strata in both instances are nearly horizontal, the formation at the base of the Rocky Mountains must have an actual elevation greatly surpassing that of the district now under consideration. For these reasons, we have been induced to consider [299] this as belonging to the small group of mountains we have already had frequent occasion to mention, and which have received from Major Long, the name of Ozark mountains. These we shall now proceed to describe, according to the information in our possession.

From an inspection of the map annexed to this work, it will be perceived that the course of the Missouri, below the mouth of the Konzas, is considerably inflected to the east, in order to pass round the end of a range of hills, rising in the angle between this river and the Mississippi. This range increases in elevation for some distance to the south-west, its highest point being somewhere near the sources of the White and Osage rivers, the two most considerable streams originating in these mountains. Farther to the south-west, losing a part of its elevation, it is traversed in succession by the Arkansa and Red rivers from the west, and gives origin to the Washita, the Sabine, and some other rivers of inconsiderable magnitude. Our acquaintance with the country between Red river and the Rio del Norte is too imperfect to enable us to trace particularly the continuation of the Ozark mountains, which is believed to extend to that river, and to have some connection with its great southern bend, below the confluence of the Rio Conchos. We will, therefore, at present, confine our attention to that portion north-east of Red river. Though there is no point of great elevation in any part of

the range, the whole is truly a mountainous region, and well entitled to a distinctive appellation. Its parallelism in general direction to the Atlantic coast, and the great chain of the Alleghanies, as well as the character and inclination of its component strata, afford unequivocal indication that it belongs to a different system from the great chain of the Rocky Mountains. In several particulars, there is a striking resemblance between this range and the Alleghanies, [300] and in some, as we shall notice hereafter, as manifest a dissimilarity.

Near the western limits of the coal formation, which are also the limits of the mountainous countries on the Canadian and Arkansa, compact limestone occurs for the first time (as far as our acquaintance extends) on this side the Rocky Mountains. This formation of limestone, and the accompanying strata of argillaceous sandstone, though they do not, perhaps, always strictly coincide in position, may be traced far to the north; and these we consider as marking the western limits of the Ozark mountains. It is to be remarked, however, that in these observations, we do not intend to apply this name with strict geographical precision to those portions only which are sufficiently elevated to be called mountains; but so far to extend its signification as to include not only the high and broken ridges, but several less elevated tracts possessing the same peculiar mineralogical features.

The few facts and observations we have it in our power to contribute towards an account of this interesting range, were collected during a pedestrian excursion from Bainbridge on the Mississippi, through the country of the lead-mines, at the sources of the Merameg and St. Francis, and a journey from Belle Point, by the way of the hot springs

of the Washita, and the upper settlements of White river, to Cape Girardeau. For many important facts we are indebted to Major Long's unpublished journals of tours in various parts of the region in question, and to Mr. Nuttall's "Travels into the Arkansa Territory."

Compact Limestone.— We commence with the consideration of this stratum, as it is one of frequent occurrence, and perhaps occupies a greater extent of surface than any other. It so frequently alternates with the micaceous sandstones, and with the peculiar flint-rock of this district, that we have never been able to devise any theory of arrangement [301] which appeared applicable to more than an inconsiderable extent of territory.

A few miles west of the Rapids of the Canadian, a thin stratum of compact limestone, of the common blue variety, and abounding in organized remains, overlays the argillaceous sandstone of the coal formation. This limestone becomes more abundant towards the south, and is the prevailing rock on that part of Red river, near the confluence of the Kiamesha.[84] At Cape Girardeau, in

[84] The valley of Red river abounds in limestone, often presenting the shells of oysters and other moluscous animals in a state of petrifaction, scattered in profusion over the surface of the ground, and retaining their original form entire, while on the Arkansa, the rocks are generally sandstone, no limestone being found, except of the Illinois, Grand, and Canadian rivers. *Major Long's* MS. Journal. Several organic relics from the country about the confluence of the Kiamesha, have been obligingly communicated by Mr. Nuttall: among these is a shell which approaches nearest to the variety of the gryphœa dilatata of Sowerby, 149. fig. 2, but the lobe is far less distinct, and the shell is more narrowed towards the hinge, and is somewhat less dilated, and much more like an ostrea. It may be thus described: G. *corrugata*, SAY.— Small valve, flat, and very much wrinkled, and like the other, narrowed near the hinge. The beak is short, and curved upwards, and laterally, and the sulcus is very distinct. Length, and greatest breadth of the small valve nearly equal; from 1½ to 2 inches. It is in a very perfect state of preservation. Mr. Nuttall brought also from Red river, a species of ostrea, which to the eye appears hardly changed. The ante-

the country a few miles in the rear of Herculaneum and St. Genevieve, and in many places throughout the district of the lead-mines, there is a coarse crystalline limestone, of a light gray colour, which is usually the lowest rock exposed in those places. It is very indistinctly stratified, and has in many respects a considerable resemblance to the more crystalline varieties of primitive limestone: for such it appears to have been mistaken by Mr. Schoolcraft, who, in his work on the lead-mines, asserts that the "mineral soil at Mine a Burton, and the numerous mines in its vicinity, reposes on primitive limestone," page 108. Afterwards, at page 119., speaking of this same primitive limestone, he says, "On going deeper, the rock again graduated into a compact limestone, very hard, and of a bluish gray colour, in which were frequently found small cavities studded over with minute pyramids of limpid quartz." And again, at the page first referred to, he informs us, "The primitive limestone passes into transition, and secondary, in various places on the banks of the Mississippi, between Cape Girardeau, and Saint Louis. We adduce these statements as confirming our own observations of the alternation of the *crystalline* or *sparry* limestone, with the compact blue variety; but as we have examined with great care several of the places mentioned by Mr. Schoolcraft, and many others apparently similar, we are disposed

rior portion of the specimens are wanting, but the greatest breadth of the remaining portion of the largest one is nearly three inches. The hinge fosse in this species is proportionably much more contracted, and smaller in every respect, than any other species of the genus we have seen; that of the specimen above mentioned is less than one-half of an inch. The specimens were evidently those of old shells, being much thickened. Another species of ostrea, a hinge fragment of an old and thickened individual, which appears to have been long, and narrow; the hinge fosse itself is long and wide. Length of the hinge more than three inches, greatest width more than one inch.— JAMES.

to think he has mistaken the character of the rock. We have never met with any [302] limestone about the lead-mines which did not contain organized remains; and the white crystalline variety abounds particularly in casts of encrinites, though these are not always manifest without careful examination.

This limestone, though rather indistinctly stratified, is marked by horizontal seams, distant one or two feet, and sometimes more, from each other. Its exposed surface becomes somewhat bleached and rough with small prominences, in which we may often distinctly trace the forms of animal remains. The recent fracture is uneven, distinctly crystalline, and much like that of many moderately fine-grained granites. Careful examination shows that in many instances the most minute particles visible under a lens, have assumed the rhombic form so common to the carbonate of lime. These crystalline particles vary greatly in size, and are sometimes half an inch across. In the interior of the casts of animal remains, they are sometimes less distinct than in parts of the rock where no such remains are discovered.

These vast beds of sparry limestone, made up almost exclusively of deposits from chymical solution, would seem to have been formed during periods when great tranquillity prevailed in the waters of the primeval ocean; and their alternation with limestones of the common earthy variety, and with sandstones made up of fragments rounded by attrition, may be considered as proofs that those periods, whatever may have been their distinguishing peculiarity, alternated with other periods of a different character.

This variety of limestone is perhaps the lowest rock hitherto noticed in the country of the lead-mines, and it may, according to the suggestion of Schoolcraft, be considered as the basis rock in that district; but as it certainly passes through every intermediate variety into the compact blue limestone, there seems to be no propriety in separating it from that rock, which often overlays the newest sandstones. If this view of the subject be admitted, it results that we are to consider [303] the whole of that part of the Ozark mountains which contains the lead-mines as belonging to a coal formation. We have met with nothing north of the Arkansa which appears to us to have any claim to be considered as belonging to the class of primitive rocks.

Mr. Schoolcraft informs us, that granite, gneiss, and mica slate exist in Missouri, but has omitted to point out the particular localities. See Views of the Lead Mines, page 92.

At St. Louis, Cote sans Dessein, Isle a Loutre, and at many points on the Missouri, the limestone partakes of the character of both the varieties above mentioned, but is rarely if ever so exclusively crystalline as in the lead-mine district. Most of the lime-stones between Franklin on the Missouri, and the Council bluffs, are distinctly crystalline, and are usually of a yellowish or reddish white colour.

The horizontal limestone near the mouth of the Ohio, is of a bluish gray colour, of a compact or fine granular structure, and contains some metallic ores often occurring in veins of beautifully crystallized fluat of lime. Near some of these localities of fluat of lime, we have observed

the rock itself to contain small and apparently water-worn masses of hornstone, and some fragments of a perfectly white granular limestone.

Petrosilex.— In the vicinity of Bainbridge, ten miles above Cape Girardeau, is a stratified gray flint rock very similar in aspect, and having nearly a similar fracture to the common gun-flint. This rock is here an extensive stratum, and occurs in connection with compact limestone. In tracing it towards the south-west, we have not been able to detect the slightest interruption to its continuity through an extent of more than two hundred miles along the central portion of the mountainous district. Towards the south-west it is found to acquire gradually a more and more primitive character, and losing, near the Chattahoocke mountain the accompanying stratum [304] of compact limestone, it appears near the hot springs of the Washita, associated with the highly inclined argillite of that district. This rock, as far as our limited observations have extended, exhibits no traces of organized remains. Its colour seems gradually to change according to its age, or at least with the apparent age of the rocks associated with it. South of the Arkansa it is of a yellowish or pearly white colour; about White river, it is a dirty yellow, and at the St. Francis a grayish brown. A corresponding change may also be noticed in the inclination of the strata, and in other particulars. Aside from this apparently intimate connection there is a particular resemblance between the petrosilex of the Washita, and the flint rock of the lead-mine district. The rock in both instances falls readily into small masses of a few ounces weight. The hills it forms have usually a rounded outline, and often bear open forests of pine, while the timber on the

sandstone hills is usually oak. Open woods of pine and oak occur in almost all the uplands in the Ozark mountains, and are considered unfailing indications of a meagre and flinty soil.

Argillaceous Sandstone.— The sandstones of this small group of mountains appear under almost every variety of character, but in most of them, as far as hitherto examined, we discover traces of coal or of those minerals and organized remains which usually accompany it. In the inclined sandstone near the hot springs, there are, it is true, no indications of coal; and that rock is in every respect similar to what are called the transition sandstones of the Alleghany and Coatskill mountains, but by following it an inconsiderable distance either east or west, it is found passing imperceptibly into the coal strata of the Poteau, and of the Little Red river of White river. In this instance, as in that of the stratum last mentioned, we find a rock apparently possessing as much unity as can belong to such a subject, passing from [305] recent *secondary* down, through all the intermediate grades, to the oldest *transition*, and thus heaping confusion upon our doctrines of the original continuity and systematic succession of strata.

A conspicuous character in the sandstones about the central and western portions of the region under consideration, is the great proportion of mica, in large scales, which enters into their composition. Fragments of the sand-rock, about the mouth of the Poteau, might be mistaken for mica slate. This mica is rarely if ever of that dark coloured variety which prevails in the Rocky Mountains; and in the other materials of these aggregates, there is a manifest want of resemblance to those

mountains. A very slight comparison of the secondary formations at the base of the Rocky Mountains, with the similar aggregates in the Ozark range, will be sufficient to convince any one that they have resulted from the wearing down of primitive mountains, very dissimilar in character to each other.

We might have remarked, when speaking of the Rocky Mountains, the absence of any formation of talcose rocks, and indeed of magnesian fossils of any kind, and a corresponding deficiency of talcose and chloritic sandstones among the secondary rocks. We no sooner arrive at the western margin of the secondary belonging to the Ozark mountains, than we meet with extensive beds of sandstone, in which the prevalence of magnesia forms a conspicuous character. The beautiful argillaceous chlorite sandstone at the rapids of the Canadian, has been already described, and similar beds are not uncommon in many places in the vicinity of extensive depositions of coal.

Another peculiar variety of sandstone occurs, in connection with the sulphuret of lead, at the old mines of St. Michael, and at many places thereabouts. This bears apparently the same relation to the common sandstones, as the crystalline limestone above [306] mentioned does to the earthy varieties, and it alternates with and passes into the common rock in a similar manner. Its particles are crystalline, and appear to remain undisturbed in the position in which they were originally deposited from solution in water. Nevertheless the aggregate is manifestly secondary, and embraces the relics of many organized beings, as is common in the other secondary rocks.

There is also about the lead mines a sandstone composed of small glimmering grains of transparent quartz, and so loosely cemented as to fall rapidly to pieces, forming a light gray sand. In this variety we have sometimes observed the lead ore either dissemminated, or forming horizontal veins between the laminæ of sandstone. An examination of some spots might lead to the conclusion that the soil in which most of the lead has hitherto been found, has resulted from the disintegration of a sandstone of this kind.

Sandstone, though often covered at the surface by compact limestone or some other stratum is probably the rock which occurs in the greatest quantity throughout every part of this range of mountains. It is the prevailing stratum in all the country between the Arkansa and Red rivers, from the confluence of the Mamelle westward; rising to the height of two or three thousand feet, to form the summits of the Cavaniol, Sugar Loaf, and Mt. Cerne, and to a less considerable elevation at the Mamelle, Magasin, Caslete, and Short mountains.

North of the Arkansa it forms the body of the Chattahoocke mountain, and of many nameless elevations, which diversify the surface from the sources of the Little Red river to the Mississippi. Beds of coarse conglomerate or puddingstone, are met with in many places; but these are particularly frequent in connection with the inclined or transition sandstones about the Washita.

Native Argil.— Nine miles west of Bainbridge, on [307] the road to Jackson, and on the right bank of the Mississippi, near the head of Tiawapeti bottom, also in various other places in this vicinity, there are extensive beds of

perfectly white native argil, of about the hardness of common chalk, for which it has often been mistaken.[85] See Schoolcraft's "Catalogue of Western Minerals," art. 1st. Notwithstanding Mr. Schoolcraft's confident assertion, it must yet be considered doubtful whether any chalk has ever been found in the region under consideration.

Specimens of the substance called chalk by the inhabitants, were collected at several places between Cape Girardeau and St. Louis. Also on the north side of the Missouri, on the road from St. Louis to Franklin. Some of these which were brought to New York, have been examined by my brother, Dr. J. James, and others, and were found to consist principally of argil, none of them occasioning the slightest effervescence with acids.

This substance, whatever it is to be considered, is dis-

[85] "A very extensive bed of native argil occurs on the right bank of the Mississippi, commencing near the head of Tiawapeti Bottom, at the Little Chain, about forty miles above the junction of the Ohio and Mississippi, and extending with very little interruption near six miles above the Grand Tower, a distance of thirty-four miles. Beyond these limits I have not observed it. Its colour is snow-white; structure fine, pulverulent; fracture dull earthy. It is amorphous, and adheres to the tongue. It does not effervesce with acids, even in the slightest degree. The bed of argil reposes on horizontal strata of siliceous sandstone, and is overlaid by shell limestone. In the vein of argil, nodules and veins of flint are arranged so as to make with the horizon an angle of about fifty degrees. The argil has been taken to New Orleans, Pittsburgh, St. Louis, &c. in considerable quantities, supposing it to be chalk, for which substance it has been used." *Mr. Jessup's* MS. Report.

"*Flint.*— This occurs in nodules and veins in a bed of native argil, above Tiawapeti Bottom. Its colours are bluish-gray and greenish-black. It gives fire with steel; fracture is conchoidal, and the edges are translucent. The veins of flint dip to the south-east." *Ibid.*

Imbedded in the chalk of Cape Girardeau, are occasionally found nodules of flint, which are enveloped by a hard crust of calcareous carbonate, arranged in concentric layers. Its colour is grayish-black, breaks with a perfectly conchoidal fracture, is translucent on the edges, and readily gives fire with the steel. *Schoolcraft's* View of the Lead Mines, p. 180.— JAMES.

tributed extensively throughout the country lying around the confluence of the Missouri and Mississippi. Some specimens have been sent from Illinois to the Lyceum of Natural History at Troy, where they are spoken of as a "lithrographic carbonate of lime;" but whether any experiments have been made to ascertain their real character we have not been able to learn. We have not, from our own observation, found occasion to confirm the statement, that nodules of flint are found imbedded in this substance; but we have commonly found it accompanied by the flint rock already mentioned, which has in many respects a manifest resemblance to the flints occurring in chalk formation. We have sought in vain for the remains of echini and other animals so common in chalk beds.

Argillite.— Of the older secondary rocks, we have observed in the Ozark mountains only the inclined [308] sandstones and conglomerates above mentioned, and a limited formation of argillite, extending a few miles around the hot springs of Washita, and re-appearing on the Arkansa at and above the town of Little Rock, being usually accompanied by vast beds of petrosilex. This latter ought, perhaps, to be considered a distinct stratum, but south of the Arkansa we have not been able to trace it uninterrupted for any great distance.

Mr. Nuttall, in his valuable Journal of Travels into the Arkansa Territory, mentions *grauwacke slate* as occurring along the Arkansa river near Little Rock, p. 105. We have observed none here in any considerable degree similar to the grauwacke slate of the transition mountains of New York, or even to that of the Alleghanies. We are aware, however, that some of the aggregates which we

call sandstones, have all the characters attributed to grauwacke slates, "*grauwacke is a complete sandstone*,"[86] and in a district where both are so intimately blended as in that we are considering, perhaps it is unnecessary to attempt any distinction between them; or we may persevere in the use of the two names at the same time, acknowledging they are both applied to the same stratum.

The hot springs of the Washita issue from clay-slate, and if we may judge from the inclination of the strata, and the distance at the surface from the granite of the cove, we may conclude a very large mass of clay-slate is interposed between the surface of the granite and the point at which the springs rise. This however it is not possible to ascertain. The hottest springs on the globe rise from beneath or within the granite,[87] and it is not improbable this rock may approach near the surface at many points [309] in the Ozark mountains, where it has not yet been uncovered.

The slate rock about the hot springs is highly inclined, often a good deal flinty in its composition, and as far as we have observed, contains no organised remains. It is traversed by large upright veins, filled usually with white quartz, contrasting strongly in colour with the dark blue of the slatestone. The elevation of the "Hot Springs mountain" is estimated by Hunter and Dunbar at three hundred feet above the surface of the creek at the springs. This point is probably raised twenty or thirty feet above the Washita at Keisler. North of the springs the slate-rocks rise to greater elevation; but it is not probable that at any point where we have seen them,

[86] Jameson in the Edinburgh Encyclopedia, Art. Mineralogy.— JAMES.

[87] Humboldt's Personal Narrative, vol. iv. p. 171. 195. vol. v. p. 553.— JAMES.

they attain the height of one thousand feet above the Mississippi.

The high lands between Washita and Red river are occupied principally by sandstone, the clay-slate appearing to extend from north-east to south-west, which, as far as we have observed, is the direction of the strata; these, when they are not perpendicular, usually dipping to the north-west.

The country about the sources of the Washita is represented as affording many interesting minerals; among them are enumerated "a martial pyrites, large bodies of crystallised spar, and hexagonal prisms, which are known to contain no small portion of the precious metals."[88] If the clay-slate in any part of this mountainous region should be found accompanied by its usual attendant, the metalliferous limestone, we should be more ready to credit the accounts of the precious metals being found, as at least some of the valuable mines in America exist in that stratum. But as yet we have no satisfactory accounts of the occurrence of that limestone, or any of the precious metals in that part of the United States.

[310] *Granite.*— About fifteen miles south-east from the hot springs, near the Washita, granite is found *in situ*. It forms the basis, and, as far as we could discover, the whole mass of a small hill, but little elevated above the level of the river; we found it emerging from beneath the soil at several parts of an area for two hundred or three hundred acres; but had not an opportunity to trace it to any great distance, nor to observe its connection with any other rock. The extent of surface which it covers, we believe, cannot be very great. This granite is very

[88] Stoddart's Louisiana, p. 391.— JAMES.

soft, and disintegrates rapidly when exposed to the air. It is compounded of grayish-white quartz, yellowish-white felspar, and an unusually large proportion of mica, in variously and brilliantly coloured masses. These large laminæ of mica are white, pearl colour, yellow, brown, green, and often black, and in some instances are so large and numerous as to exceed in proportion the other ingredients of the aggregate. Talc also enters in large proportion into the composition of this granite. It is indeed sometimes so abundant as to occasion a doubt whether the whole should not be considered a bed of talc, rather than granite. This talc is in tabular masses, two or three inches in diameter, and about half an inch in thickness. Zeolite is also so abundant as sometimes to seem to take the place of the other materials of the granite. It is of two varieties, radiated and mealy. Stilbite (blaettriger zeolith of Werner) occurs in connexion with zeolith. The bed of one of the small streams which traverses this formation of granite is paved with small crystals of schorl, that of another with native magnet. Sulphuret of iron is disseminated in the granite. Several of the appearances presented by this interesting mass of granite, would seem to countenance the opinion that it is of secondary origin, like that mentioned by Saussure, as existing near the valley of Valorsine, at Semur en Auxois, and at the city of Lyons. In speaking of the granite [311] at these places, he says, "It could not be doubted on seeing these heaps of large crystals, that they are the produce of the rain-waters, which, passing through the granite, have dissolved and carried down these different elements, and have deposited them in these wide crevices, where they

have formed new rocks of the same kind. The crystals of these new granites are larger than those of the ancient, on account of the repose which the waters enjoyed in the inside of these reservoirs."

The granite of the Washita, if it is to be considered as of secondary formation, appears to be much more extensive than any of the kind hitherto known. Many more particulars must, however, be ascertained before this question can be settled. We are ignorant of the manner of its connection with any other rock. Nor do we know of any formation of primitive granite from which it could, by the action of water, have been derived. One can have no hesitation, however, in considering the Ozark mountains, as a separate system within themselves, and having no immediate connection with the Alleghanies or Rocky Mountains. The sandstones which lie about these mountains, abound much more in mica than those near the Rocky Mountains, nearly in the same proportion as the granite of the latter has less than what is met with in the little we have seen of the former. The Ozark mountains exhibit evidence of metallic riches far exceeding any thing that appears in the Rocky Mountains. May not an extensive range of granite and other primitive rocks have existed at some distant period where the Ozark mountains now are, containing the vast quantities of the ores of lead, iron, &c. now found in rocks of recent secondary origin, and even in the alluvial? and may not the operations of water during many ages, when an ocean rolled over the summits of these mountains, have worn down those primitive rocks, their detritus having been deposited horizontally upon their submarine sides and summits; [312]

so that the greater part of their surfaces are now covered by secondary aggregates? Our acquaintance with this range is however much too limited to admit of indulgence in such speculations.

Numerous specimens of minerals brought by Lieutenant Graham and Dr. Somerville from the Upper Mississippi and the Illinois rivers and others from that region, now in the possession of Dr. L. C. Beck, of St. Louis, have a peculiar resemblance to similar minerals met with in the Ozark mountains, south of the Missouri. From these resemblances, and the corroborating testimony of all the accounts we have received concerning that country, rich in mines, which lies along the eastern side of the Upper Mississippi, we have been induced to believe that a continuation of the Ozark mountains, or at least, of a region similar in Mineralogical features, extends from the confluence of the Missouri, northward to the sources of the Wisconsan, and the Ontonagon river of Lake Superior, north of the Missouri, the country is very little elevated; but aside from this it appears to possess all the peculiar features of the region we have been considering. The sandstones, the limestones, and other rocks, have a striking resemblance. Both regions abound in the ores of lead, and both afford copper.[89]

We are aware that the great irregularity in the direction of the ridges accessory to this range, and of the dip and inclination of the older secondary rocks belonging to it, may be considered objections to our idea of the connection and continuity of the different parts and the general direction of the group. But we are by no means anxious to maintain the position we have assumed. Our exam-

[89] Copper has been found in Illinois, near the sources of Cache river.— JAMES.

inations have been limited, and we shall rejoice in any opportunity of correcting our errors, and enlarging our acquaintance with this interesting range of country.

[313] We subjoin in a note some account of a few of the most interesting minerals hitherto observed in connection with the rocks of this district.[90]

[90] "*Fluate of Lime.*— This mineral occurs in great abundance seventeen miles south of Shawaneetown, Illinois, on Peter's creek, and proceeding about thirteen miles in a south-west direction, it again appears on and near the surface of the ground; at the three forks of the Grand Pierre creek, maintaining the same course, it breaks out in several places for near twenty miles. This beautiful and useful species of lime occurs at Peter's creek, almost invariably in a crystallized form; the crystals are universally cubes: at the three forks of the Grand Pierre creek, it occurs in masses of several feet in diameter. Both the crystallized and massive varieties, possess almost all the shades of colour and have been observed in the European specimens: viz. green, violet, blue, red, yellow, white, black, and rose-coloured. This mineral varies in transparency, some specimens being perfectly limpid, others opaque. Some of the violet and rose-coloured specimens, when recently fractured or pulverized, yield a strong bituminous odor; this character (which has never been observed heretofore as belonging to this species of lime) is perceptible only in the crystallized specimens.

"The vein of fluate of lime is apparently very extensive; very few minerals have been found associated with it, at the above localities. I saw at Peter's creek a few specimens of laminated calcareous spar, and a few of sulphuret of lead. Excavations have been made by several gentlemen who reside in that vicinity, for lead, but no veins or beds of this ore have been found.

"From examination of the situation of those specimens which I found, and the general appearance of the vein of fluor spar, I do not think that there is a sufficiency of lead ore, to reimburse the expenses that would be necessarily incurred in mining. The accompanying rocks of the vein of spar are compact limestone, sandstone, and oolite." *Jessup's* MS. Report.

"*Concreted Carbonate of Lime, variety Oolite.*— This occurs on Peter's creek, seventeen miles south of Shawaneetown, Illinois, associated with compact limestone, and sandstone, in the gangue of the fluate of lime. It is composed of globular masses, about the size of English mustard-seed, which are united by a calcareous cement; the nucleus of the globules are detached, leaving a small cavity in the centre of each; its colour is yellowish-white; fracture dull." *Ibid.*

"*Sulphuretted Hydrogen Gas.*— This gas is very abundant in the water of many of the springs and wells in Missouri territory. Its origin is probably owing to the decomposition of sulphuret of iron. Six miles west of St. Louis is a large spring of water strongly impregnated with this gas; its odour is perceptible to the distance of four or five hundred yards from the spring. It is reported, that the

Recapitulation

The Ozark mountains extend from the sources of the Rio Colorado of Texas on the south-west, to the confluence of the Mississippi and Missouri on the north-east, and

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water has proved beneficial in cases of cutaneous disorders and rheumatic complaints." *Ibid.*

"*Red Oxide of Iron.*— This occurs, though not very abundant, in the hills near Isle a Loutre, on the Missouri river. Its texture is compact, fracture earthy. Its external colour is brownish red; its streak and powder is blood red. This variety of ore produces good iron, and yields from sixty to eighty per cent." *Ibid.*

"*Hematitic Brown Oxide of Iron.*— This variety of iron ore occurs in considerable quantity in the vicinity of the vein of fluate of lime, near Shawaneetown, Illinois. It occurs there under a number of imitative forms, such as tubular, stalactitical, nodular, botryondal, and reniform. Its colour is blackish and yellow brown; it is easily fused, and will produce near sixty per cent. of good malleable iron." *Ibid.*

"*Argillaceous Oxide of Iron.*— This variety of iron ore is abundant in the western parts of Pennsylvania and Virginia, and in Kentucky, where it is almost the only ore of iron that is worked. The principal furnaces in Pennsylvania, are in Cumberland, Northumberland, and Centre counties, and on the Juniata river." *Ibid.*

"*Columnar Argillaceous Oxide of Iron.*— Near the confluence of the Ohio and Tennessee rivers, is a locality of argillaceous oxide of iron, of a columnar structure, and so rising from the surface of the ground as to have some resemblance to cypress trees. This mineral has by many been thought of volcanic origin; at least, that the cause of its peculiar form is, in some measure, connected with the operation of volcanic causes." *Ibid.*

"*Sulphuret of Lead, or Galena.*— This mineral is abundant in Missouri territory, about sixty miles south-west of St. Louis; but as I had not an opportunity of visiting the mines I cannot say any thing respecting its geological situation or quantity. There are two reservations for lead in the vicinity of the United States' Saline, Illinois. From external appearances, I should judge, the ore was abundant; but from the success of former diggings, and the situation of the ore, which has not as yet been found there, either in beds or veins, but sparingly diffused in small masses (attached to the fluate of lime) not exceeding in weight two or three pounds, I think the quantity inconsiderable. Every specimen of sulphuret of lead that I saw there, possessed a crystalline form." *Ibid.*

"*Sulphuret of Zinc, or Blende.*— Fifteen miles south of Shawaneetown, Illinois, uniform masses of argillaceous iron ore enclosed in concentric layers of slate clay, are found in a bed of slate clay. In the argillaceous iron ore small particles of sulphuret of zinc occur. This is the only locality west of the Alleghany mountains that I have seen of this ore." *Ibid.*— JAMES.

are continued in a low range from this point towards Lake Superior. They are widest in the south-west, and in that quarter they mingle with some low tracts of secondary sandstone, extending from near the Gulf of Mexico to the base of the easternmost ridge of the Rocky Mountains. Whether there is any similar expansion at the northern extremity, or whether this range is connected as a spur to the great primitive chain supposed to exist north of the great lakes, and is separated by a wide secondary and alluvial valley from the Rocky Mountains, is yet to be determined. This range consists of low ridges, irregular in direction, rarely rising to an elevation of more than 1500 or 2000 feet, and consisting principally of secondary rocks.

The strata are —

1st. *Granite* — at the cove of the Washita.

2d. *Argillite* — ranging north-east and south-west from Little Rock on the Arkansa to the hot springs, and thence to the sources of the Kiamesha.

3d. *Transition Sandstone* — a narrow margin, following nearly the same direction on the north-west side of the argillite, and usually inclining like it to the south or south-east.

4th. *Flint* (petrosilex) — From the hot springs north-east to the Mississippi, and usually forming the basis of the pine-lands.

5th. *Limestone* — Compact and sparry; distributed [314] in the same direction as the last, but more extensive.

6th. *Argillaceous Sandstone* — with extensive beds of coal, and abounding in mines of lead.

7th. *Alluvial* — There are many extensive tracts of deep argillaceous or calcareous loam; in other instances, a more

meagre soil has resulted from the disintegration of the sand-rock.

These are the remarks we have been able, from observation, to make respecting the geology of a part of the United States' territory, west of the Mississippi. Relating to that part of the interior of our country which lies north-west of Lake Superior, and north of the sources of the Missouri, we have little satisfactory information. From the accurate and intelligent Mackenzie,[91] we are however able to collect a few important particulars. This enterprising voyager, it is well known, travelled from Montreal, L. C., in latitude 45° 30′, longitude 74°, in a north-west direction, to the mouth of Mackenzie's river, latitude 69°, longitude 135°; and again, at a later period, leaving his former route at the Lake of the Hills, about midway between Lake Superior and the mouth of Mackenzie's river, he ascended, in a south-west direction, the Unjegah, or River of Peace, to the Rocky Mountains, and crossing them, fell upon the sources of the northern branch of the Columbia, and from thence arrived at the Pacific, at a point a little north of the inlet of Queen Charlotte's sound. From him we learn that the Rocky Mountains continue in an uninterrupted chain, from the sources of the Missouri in the south, to a point beyond the sixty-fifth parallel of north latitude, near the mouth of Mackenzie's river. The River of Peace which he ascended in his journey to the western ocean, has its source in these mountains in about 55° north, nearly opposite to those of the great northern branch of the Columbia. Farther towards the south are the sources of the Saskatchawin, a large

[91] For sketch of Mackenzie, see Franchère's *Narrative*, in our volume vi, note 4.— Ed.

river, discharging itself from the [315] north-west into Lake Winnipic. The mountains in this part seem to be less elevated than those more to the south, but in other respects entirely similar. Their northern termination, according to this traveller, is in about north latitude 65°, 130° west longitude. Santa Fé in New Mexico is in latitude 36°, longitude 104° 53′ west.[92] From this it will be perceived, that the general direction of this great mountain range is nearly from north-north-east to south-south-west. We have no evidence to confirm the conjecture, which, nevertheless, is highly probable, that the principal ridges of this range consist through their whole extent of granite or other primitive rocks. Considering the stupendous character, the great elevation and uniformity of the appearance of that portion of these primitive mountains with which we are acquainted, we should be led to look for similarity of character, and similar uniformity throughout. It is commonly believed, as asserted by Maclure, that "a large mass of primitive occupies all the northern part of this continent;" and he considers the great Atlantic range of primitive, the mountains of New England, New York, and the Alleghanies, as a spur for this formation. We are not acquainted with the grounds on which this opinion is founded, but we see no reason to consider it an improbable one. Of the northern boundary of that vast formation of secondary which certainly occupies a very large portion of the interior of this continent, we are ignorant. On the south-east, its limit is the irregular border of the transition of the Alleghanies, commencing between the Alabama and Tombigbee rivers, and running north-west to Fort Anne, near Lake Champlain. From

[92] Lafora, cited in Humboldt's New Spain.— JAMES.

this point, a narrow and perhaps interrupted strip of secondary extends through the valley of Lake Champlain to the upper parts of St. John's river. The island and mountain of Montreal are of secondary. The country [316] also between St. John's and La Prairie is most probably secondary, as is much of that along the St. Lawrence below Montreal. From the termination of the transition near the confluence of the Alabama and Tombigbee, the secondary rocks continue on the south-west, sometimes concealed by the recent alluvial to the Black-lake river, near Natchitoches. Beyond this, the information we have is not satisfactory. From this point, turning north-west, we may for the present consider the Red river of Louisiana as the boundary of the secondary, or rather the limit of our acquaintance with this formation.

Beyond the Ozark mountains, the district between the Red river and the Canadian is occupied by the red sandstone of the salt formation, mentioned when speaking of that region, and is undoubtedly to be considered secondary. How far it extends to the west beyond the sources of Red river and the Canadian, we are unable to determine. At the commencement of the most eastern ridge of the Rocky Mountains, a few south of the high peak, and at no very great distance north from Santa Fé, the boundary again becomes determinate. From this point it runs nearly north one hundred and fifty miles, where it crosses the river Platte. From the narrative of Lewis and Clarke, we are enabled to determine with sufficient accuracy, that it crosses the Missouri not far from the Falls, in longitude 110° west. Beyond this, the little information we have, we owe to Sir Alexander Mackenzie. He informs us,

that great quantities of pit coal are found about the sources of the Saskatchawin which lie near the Rocky Mountains, and between 50° and 55° north latitude. The sources of Saskatchawin are placed by this traveller near the base of the Rocky Mountains; and the coal formation which he mentions, lies on the margin of a plain extending far to the north and east. The Saskatchawin running to the east, traverses 15° of longitude, and discharges its waters into Lake Winnipic in [317] latitude 53° north. Lake Winnipic is connected by the Severn and Port Nelson rivers to Hudson's-bay. There is a water communication, interrupted by one portage, from the Saskatchawin, north-west, to the Mississippi or Churchill's river; and from thence, by the Lake of the Hills, Slave Lake, and Mackenzie's river, to the North Sea. Near the Lake of the Hills, in latitude 59°, Mackenzie found several brine springs. This, though not decisive evidence, perhaps justifies the conclusion, that secondary rocks exist in that neighbourhood. A view of the character and direction of the several large rivers which traverse the region about Hudson's Bay, of their numerous inosculations, and the number and position of the small lakes which abound in every part of it, afford, at least, presumptive evidence, that it is an extensive plain little inclined in any direction.

We may, perhaps, venture to conclude, that the secondary formation extends uninterrupted along the base of the Rocky Mountains, as far as to the Saskatchawin, where coal was observed by Mackenzie. What lies beyond is as yet unknown. From this coal formation, our boundary must for the present run in a direction a little south of east to Lake Superior, whence it may, with a few inconsiderable interruptions, follow the territorial

boundary of the United States, until it arrives at 45° parallel of latitude, thence by the St. Lawrence to Montreal. The slight acquaintance we have with the country north of this line, is perhaps insufficient to justify the conjecture, that secondary formations occupy an extensive portion of that country. It is improbable, that formations of secondary extend along the base of the Rocky Mountains through their whole course, and from thence spread themselves to the east, knowing no limits but Atlantic mountains, the shores of the Gulf of St. Lawrence, and the northern ocean. We know that rocks of this formation exist about the [318] Gulf of St. Lawrence, whence coal, plaster, and sandstone, are brought to our markets.[93]

This boundary of the great formation of secondary rocks, which occupies so large a portion of the interior of our continent, includes a vast area of surface, extending through 25° of latitude, and 60° of longitude. I intend to consider that portion of it only of which the state of facts at present known enables us to speak with some degree of confidence. This portion may be conceived as occupying the area of a large triangle, the base of which is a line running from Montreal in Lower Canada, southwest to a point, near the outlet of the river Sabine, the western boundary of the state of Louisiana. The summit would be at the sources of the Saskatchawin, which are west of north from the mouth of the Sabine, and north of west from Montreal. The Rocky Mountains on the

[93] The banks of the river Montmorenci, from the natural steps downward to the St. Lawrence, are composed of a lime slate placed in horizontal strata from the depth of five to twenty-four inches, each connected by fibrous gypsum of a whitish colour. Heriot's Travels, p. 88. The island of Cape Breton abounds in sandstone, coal, and plaster. *Ibid.* 431.— JAMES.

west, and the Alleghanies on the south-east mark the limits of the secondary in those directions. Its extent towards the north and north-east is as yet unknown.

In the wide space included within the lines above mentioned, we know of but one exception to the remark, that all the rocks found in place are secondary. This is the instance of the Ozark hills traversing the horizontal strata from south-west to north-east, somewhat in the manner of a whindyke. The most striking peculiarity of this range, is the prevalence among the secondary strata of crystalline substances, and what are called rocks of chymical deposition, and the alternation of these with beds and strata whose integrant particles bear evident marks of having been worn and rounded by mechanical attrition. [319] Appearances of this kind are observed in all formations of secondary rocks, but it is believed, are, in few instances, as extensive or as numerous as in this. It is well known, that the ores of lead, so abundant in many parts of this range, occur in the uppermost strata of horizontal sandstone, or in primary soils superimposed upon those sandstones. It has been suggested, that these ores of lead may have been brought down in the alluvion of rivers from some more ancient and elevated region, but any one who shall examine them in connection with the substances with which they are now found associated, will, we think, be convinced of their having been of contemporaneous origin with the sandstone. That the sparry limestones, the crystalline sandstones, and perhaps the ores of lead, (almost invariably found in the form of crystals,) have been deposited from solution in water, is highly probable; and that these depositions must have

taken place in connection with circumstances not unfavourable to animal life is evident, as all these crystalline rocks abound in organised remains.

In attempting an explanation of these appearances, can any assistance be derived from recourse to the ingenious suggestion of Bakewell, that *the matter of these crystalline beds and strata has been ejected from beneath the crust of the earth in a state of chymical solution.* These submarine eruptions may have been numerous, and may have happened at different and remote periods; hence the alternation of rocks, consisting of particles mechanically aggregated together with those of chymical deposition. Hence the existence of metallic ores overlaying recent marine sandstones and compact limestones; for these ores, in a state of solution, may have been the matter thrown out in some of the latest eruptions.

This supposition may derive some confirmation from the well known fact that this region is still in a remarkable degree subject to subterranean concussions [320] and earthquakes. These concussions centring apparently in this range of mountains, and felt at times throughout all the western parts of the United States, are certainly too considerable in force and extent to be attributed to the operation of a cause so limited and superficial as the decomposition of beds of lignite lodged among the alluvion of the Mississippi. We do not insist upon the accounts that have been so often circulated, of the blowing, smoking, and burning mountains, said to exist in the country west of the hot springs of the Washita, because these accounts want confirmation.

Though this range of mountains has probably a nucleus of primitive rocks running through its whole extent: yet

these appear but rarely at the surface. We have seen such only in the places already mentioned, and have been informed of others in Washington county, near the sources of the St. Francis, and about Lake Superior.[94]

From the information we have been able to collect, we are induced to believe that secondary rocks occupy the country on both sides of Red river, from its sources to its confluence with the Mississippi. If this be the case, the primitive of the Ozark mountains must be considered a small and insulated mass.

The inequalities of surface in this great secondary formation are considerable. It has often been called the "basin of the Mississippi," but with little propriety, since it might with equal accuracy be called the basin of the St. Lawrence, the Saskatchawin or Mackenzie's river. The form of that part of it which contains the Mississippi, is however similar to that designated by geologists as *a basin-shaped cavity*. As far as our acquaintance extends, it is bounded on all sides, except a narrow space at the outlet of the Mississippi, by a surface of greater elevation than itself. But whether this surface is not sometimes of secondary [321] formation is doubtful. It is dangerous to infer the existence at a former period of an insulated inland sea from any formation of secondary rocks, without being acquainted with its whole extent, with its elevation at different points, and its connexion with other rocks. On the south-east, secondary sandstones and depositions of coal are met with in some of the most elevated parts of the Alleghany mountains. The positive elevation of the primitive mountains of New England is, except at a few points, scarce equal to that of the secondary in the western

[94] Schoolcraft.— JAMES.

parts of the state of New York. From the primitive rocks near Philadelphia, to the secondary of the Alleghanies, is an almost uninterrupted ascent. The clay-slate and granite of the Washita, occupy nearly the lowest part of the surface of the Mississippi valley. We are as yet destitute of barometrical or other observations, by which we might determine the actual height which the secondary rocks reach on the sides of the Rocky Mountains. Pike estimates the elevation of the plain at the foot of the mountains, at 8000 feet above the level of the ocean. This is doubtless overrated. We have already observed, that secondary rocks are found upon the sides of the Rocky Mountains, considerably above the level of the plain. It is probable, that this estimate of Pike's far exceeds the truth, yet any one who considers the great length and rapidity of the rivers which flow from that region, the severity of cold in winter, the rapidity with which evaporation is carried on in summer, the transparency and peculiar aspect of the sky, will be convinced that those tracts are highly elevated; and there is unquestionably good reason to believe, the secondary rocks along the eastern base of the Rocky Mountains have in many points an elevation at least equal to the summits of the Alleghanies.

This vast formation of secondary, extending as it probably does from the Gulf of Mexico to the Northern ocean, and from the Bay of St. Lawrence [322] to the Rocky Mountains, must of necessity occupy in various parts different and sometimes great elevations: like other great fields of the same formation, its borders are marked by high and broken ridges, which become less elevated and less frequent towards the centre. Sandstone appears

to be the basis and predominating rock occupying the borders contiguous to the primitive and transition, and passing under the more recent secondary. In this sandstone on the outskirts of the secondary, have been found most of the extensive coal beds hitherto known, also gypsum and brine springs.

Horizontally stratified limestone is met with in many parts of this formation, but is most abundant in the central portions, about the beds of the great rivers, and in those parts which have the least positive elevation. Compact limestone is a name sometimes used to designate all the varieties of that rock occurring in districts of secondary, but is certainly inapplicable to the limestone about Cape Girardeau and in many other places, which is notwithstanding manifestly secondary. Some of the limestone north-west of the primitive on Hudson's river, about the Coatskill and Hellebergh mountains, is of this crystalline variety, but abounds in marine exuviæ. That of Lake Champlain, as well as the greater part of that in the interior and western parts of the state of New York, is of the compact blue variety. From the falls of the Ohio at Louisville to Cincinnati, a mixed kind, partaking of the character of both of the before-mentioned varieties, is found along the river, and for some distance on each side. From Dr. Drake we learn, that this limestone is confined to a small district, and is on all sides bounded by sandstone, which rises from below it, and on which it is supposed invariably to rest. Whether the red sand-rock which is found on the south-west branches of the Arkansa, in a horizontal position, and in an highly inclined one skirts the Rocky Mountains, [323] extends to other parts of this formation of secondary, we are unable to say.

Throughout the country adjacent to the Ohio river, the prevailing and basis rock is a gray horizontal sandstone, often approaching in character those varieties which contain coal. It embraces extensive beds of coarse conglomerate, and supports or alternates with compact limestone.

Of the Alleghany Mountains

By this name we intend to designate the great range of mountains extending parallel to the Atlantic coast, from the sources of the St. John's river in New Brunswick in the north-east, to the confluence of the Alabama and Tombigbee in the south-west. An outline of this great chain has already been traced by Maclure, and particular accounts of portions of it are to be found in the works of Eaton and others; we shall, therefore, confine our attention to those strata, which, forming the north-western side of the range, are most intimately connected with the great secondary formations of the west.

1st. *Granular Limestone* — Appears in every part of the United States, where it has hitherto been observed to be the uppermost in the series of primitive rocks. It is true, it is often found to graduate, by minute and imperceptible shades of difference, into that which is decidedly secondary. Instances of this have been observed so frequently that the fact can be no longer questioned. This fact, and others of the same kind, ought not, perhaps, to be considered as invalidating the received opinions with regard to the classification of rocks according to the doctrines of Werner. If a division is to be made of the rocky strata of the earth into primitive, transition, &c. it is, perhaps, of little importance whether the boundaries thus instituted

shall traverse beds of the same substance, [324] or separate contiguous strata composed of different materials.

That series of rocks next in order to the primitive limestone above mentioned, has been very generally denominated the Transition Class. It comprehends the following strata: *Metalliferous limestone*, *Clay-slate*, *Graywacke*, and *Graywacke-slate*, and *Old Red sandstone*. If we confine our attention to the consideration of these rocks as they exist in our own country, we shall find them appearing in their different localities under circumstances of considerable uniformity.

2d. *Metalliferous Limestone.*— The prevailing colour of this rock is blue, of various shades and intensities, varying into yellow and gray. It has usually a close texture, an even, large conchoidal, or somewhat splintery fracture. In many varieties the surface, by long exposure, becomes coated with an incrustation of a yellowish white powdery matter, which adheres closely. It is frequently traversed by small reticulating veins of quartz or calcareous spar, which, during the gradual decomposition of detached masses, resist the progress of disintegration, and are left standing out from the surface, giving it a chequered appearance. It is the lowest and is considered as the most ancient of the rocks containing organized remains, which are those of cryptogamous plants, and animals without sight.

Geographical distribution.— This rock occurs extensively along all the north-western side of the primitive of the great chain of the Alleghanies. In lower Canada and Vermont, it is accompanied by granular limestone and granular quartz, which separate it from the mica slate and talcose rocks on the east. [See Eaton's Index to the

Geology of the Northern States.] It is there usually inclined towards the west, at an inconsiderable angle. It is separated from the compact fletz limestone of the valley of Lake Champlain by a stratum of old red sandstone, which forms [325] the upper part of a range of hills, called, in Vermont, the Snake mountain. In Berkshire county, in the western part of Massachusetts, and along the eastern side of the Hudson in New York, a stratum of primitive clay-slate intervenes between this rock and the granular limestone. The New Lebanon mountain, which is of slate, and divides the primitive limestone of Pittsfield, Richmond, Stockbridge, &c. from the transition which occurs at New Lebanon springs, and along the western base of this range, is considered primitive. (*Dewey in Silliman's Journal.*) To the north-east of the Hudson river, the transition limestone nowhere occupies any great extent of surface from east to west, but is a narrow strip running along the margin of the primitive, and in a few miles is succeeded either by red sandstone, or clay-slate resting upon it. In Vermont, in the same neighbourhood, it alternates with clay-slate, and supports red sandstone.

Crossing the Hudson above the highlands, and proceeding south-west, little of this stratum is seen in the lower part of New York; but it becomes more abundant in the western parts of New Jersey and Pennsylvania. If we suppose the whole of the Alleghany mountains of Pennsylvania, Maryland, and the western parts of Virginia, removed to a level with the surface at base of their eastern declivities, it is probable their foundation, which would be thus exposed, would be found through their whole extent to be of transition limestone. This rock is almost the only one which occurs between the primitive limestone.

About twenty miles west of Philadelphia and Harrisburgh, Cove Hill, the North and South mountains, and the other eastern ranges of the Alleghany, are all based upon metalliferous limestone. It is seen emerging from beneath the sandstone which forms the body of these mountains at O'Connel's town, and in most of the vallies between the Alleghanies. We learn from Maclure, that it extends itself to the south and west, nearly to the termination of this range of mountains at the [326] confluence of the Alabama and Tombigbee rivers in Mississippi.

3d. *Transition Argillite.*— This name is intended to comprehend not only the common varieties of the clay-slate of transition, but also some varieties of graywacke, and the siliceous slate by some considered a distinct stratum. It is believed, that throughout the range of country occupied by the several rocks here mentioned, they will be found too intimately blended, and too closely entangled with each other, to allow of their being considered as separate formations.

Geographical distribution.— The formation including the above mentioned rocks, may with propriety be denominated clay-slate of transition. As far as our acquaintance has extended, it occurs in all its localities associated with metalliferous limestone, or old red sandstone. It is not to be confounded with the primitive argillite which occurs below transition limestone, and is met with in the highly primitive parts of New England, nor with the aluminous schist of the great secondary formation to the west. It is distinct from either; and in most instances its character is marked with sufficient distinctness. It occurs in the central portions of that extensive field of transition which skirts the western margin of the primitive of New York

and New England, and forms the great body of the Alleghany and Cattskill mountains. It is wider and more extensive in the north, occupying much of the surface in Vermont, the northern parts of the state of New York and Canada. In the Alleghany mountains of Pennsylvannia, Maryland, and Virginia, its beds are of great thickness, and form, in some instances, the prevailing rocks, being, however almost invariably overlaid by sandstone. It has, in several instances, been observed to contain impressions of organized remains, but these are usually those of zoophytic animals, and are exceedingly unlike those found so abundantly in the schist of coal formations. Its colours are variable, it [327] is, however, most commonly blueish, black, or dark brown. Between Albany and Pittsfield, it is met with of a green colour, and a few miles to the south-east of White-hall, New York, it is bright red.

The *graywacke*, which in this very general and hasty view we have considered as in part belonging to the clay-slate of transition, appears to us to form the connecting link between that clay-slate and the old red sandstone. In attempting to give a more detailed account of these formations, we might perhaps speak of the graywacke as others have done, as a distinct stratum. We have, however, usually found it so intimately blended either with the sandstone or clay-slate, that in this enlarged view we see no necessity for a separation. We cannot agree in opinion with some who have considered the graywacke as the substratum of the great secondary formation of the valley of the Mississippi. We have found it almost invariably overlaid by an inclined sandstone, separating it from the secondary rocks towards the west. This may not be as often the case at the north, as in Pennsylvania, Maryland,

and Virginia. Mr. Eaton is of opinion, that "graywacke underlays all that district of country in the interior of the state of New York, which would be bounded on the north by a line drawn from Albany westward to the Onondaga salt springs; on the west, by a line running from the salt springs by Bath to the Pennsylvania line; on the south, by a line running thence to Newbergh on the Hudson, above the highlands; and from thence to Albany, by a line running parallel to the river, at a few miles distance." We are informed by Governor Clinton,[95] that coal strata exist in the western part of the state of New York, and we are induced from the analogy of the other parts of the same great secondary formation, to believe that the brine springs of Onondaga rise not from graywacke, [328] but from the sandstone of that coal formation. According to Maclure,[96] old red sandstone appears from under the limestone and other strata at Lewestown, ten miles below the falls of Niagara, and also near the salines of Onondaga in Genessee county. "This," says he, "would give some probability to the conjecture that the old red sandstone is the foundation of all this horizontal formation, and is perhaps attached to some series of rocks laying on the primitive north of the Great Lakes."

Sandstone of Transition. Old Red Sandstone of Werner? — Throughout the whole extent of the transition formation before mentioned, a sandstone occurs, evidently belonging to the oldest depositions of that rock. It is for the most part distinctly stratified, and in all cases its stratifications are inclined. It consists of grains of quartz, united by a scanty cement, and usually more or less

[95] See his speech at the opening of the session of 1822.— JAMES.

[96] Observations on the Geology of the United States, p. 57.— JAMES.

rounded, as if by attrition and the operation of currents of water. Their fragments vary in magnitude from the finest sand to boulders of several pounds weight. Among the Alleghany mountains are many extensive beds of pudding-stone or coarse conglomerate, usually coloured by oxide of iron. It is also to be observed, that this formation of transition sandstone sometimes embraces extensive beds, whose integrant particles have by no means the appearance of having been rounded by attrition. As in the case of almost all the rocks of secondary formation, there appear to have been periods during the time of its deposition when the waters of the superincumbent ocean ceased to throw down the mechanical *débris* of former rocks, and deposited earthy matter from a state of chymical solution. It is perhaps one of the most interesting and most difficult problems which remain unsolved, to account for the alternation through the whole series of lower secondary and fletz rocks, of [329] beds of strata of mechanical with those of chymical deposition.

The Alleghany mountains in New York, Pennsylvania, Maryland, and Virginia, are made up principally of rocks belonging to the transition class, and among these sandstone is perhaps of more frequent occurrence than any other aggregate. We are aware that Maclure has not considered the sandstones of the Alleghany mountains generally, as belonging to the old red sandstone formation of Werner; and it must be acknowledged there is some difference, at least in colour, between the ferruginous sand-rock, which commences on the shore of Tappan bay near Nyac, and extends south and west by the way of Newark, Amboy, and Brunswick, in New Jersey, and that which forms the body of the Cove, Sideling and

Alleghany ridges farther to the west. But we cannot discover so marked a difference between the sandstone of the localities last mentioned, and that which occurs about the South mountain in Pennsylvania, that at Hagerstown in Maryland, and near Harper's ferry, in Virginia, which Maclure considers as the *old red sandstone.* Indeed, this last appears to us in almost every respect to resemble the inclined sandstone which prevails so generally throughout the middle and eastern ridges of the Alleghany mountains in Pennsylvania and Maryland. We have already stated the opinion, in part sanctioned by the observations of Maclure, that the old red sandstone is the great substratum of the part of the secondary formation south of Lake Ontario. If this be the case, what stratum, if not the old red sandstone, should be seen emerging from beneath that secondary along its south-eastern margin? We will not, however, contend for the name. It is sufficient for our purpose to state, that the sandstone so abundant in all the principal ridges accessory to the Alleghany on the east, has the character of a rock belonging to the transition class of the Wernerians; that is, its [330] strata have a somewhat regular dip and inclination; it contains no beds of bituminous coal, though many of anthracite, and few organised remains. Near the summit of the ridge called particularly the Alleghany, the change to secondary begins to appear. Without the interposition of any other stratum, and without any sudden change of features, the strata of sandstone become nearly horizontal, assuming gradually all the characters of secondary rocks. About one mile west of the summit of the Alleghany, on the road from Philadelphia to Pittsburgh, the first indications of coal are observed. Descending into the vallies, the transi-

tion strata again emerge to the light. The same thing happens in the case of Coatskill and other mountains west of the Hudson, their basis being of transition, and their summits crossed with secondary.

The horizontal sandstones connected with the depositions of coal occurring along the Ohio from Pittsburgh to the confluence of Green river, assume various characters,[97]

[97] The following are descriptions of the rocks that alternate with each other as they occur, in connection with the coalbeds at Pittsburgh; commencing with the uppermost and proceeding in a regular gradation to the lowest, that we have had an opportunity of examining.

No. 1. A loose-grained argillaceous sandstone, composed of minute grains of quartz and decomposed felspar, united by an argillaceous cement. Its colour is yellowish gray; fracture uneven; stratifications imperfect. It contains no organic remains; depth of the bed near four feet.

No. 2. Bituminous shale; natural colour brownish black, that of the streak dark gray. Before the blow-pipe it decrepitates, burns with a bright flame, emits a bituminous odour, and soon becomes nearly white. Its structure is slaty; no animal or vegetable is contained in it, small veins of clay are dispersed irregularly between the layers. Depth of the strata ten feet.

No. 3. A bed of bituminous coal; its colour is brownish black, cross fracture uneven, longitudinal slaty; fragments tabular, right angled; lustre resinous; is semihard, sectile and very brittle. Vertical and horizontal beds of indurated clay, containing a small quantity of bitumen, occur in the coal. Depth of the bed from two to eight feet.

No. 4. Bituminous shale possesses the same character as No. 2. Varies in depth.

No. 5. Indurated clay; its colour is lead-gray; fracture, in situations where it has been subjected to the combined actions of moisture and the atmosphere, irregularly slatose; in others uneven. Depth of this bed seven feet.

No. 6. Argillaceous chlorite slate, passing by regular gradations into argillaceous chlorite sandstone. Natural colour, yellowish green, that of the streak light gray; cross fracture uneven. Its powder is soft and slightly greasy to the touch; it contains no organic remains. The depth of this bed varies.

No. 7. Compact limestone, intimately mixed with alumine; it contains small veins of calcareous spar dispersed throughout the mass. Veins of angular fragments of carbonate of lime, united by a calcareous and argillaceous cement, extend irregularly through the rock. The fracture, in some specimens, is compact and earthy, in others uneven.

No. 8. Argillaceous chlorite sandstone, consisting of minute grains of quartz, chlorite slate, and talc, united by an argillaceous cement; its colour is yellowish

and often support extensive formations of compact limestone.

green; fracture uneven; the powder is soft, and feels greasy to the touch; it is destitute of organic remains.

No. 9. A loose-grained argillaceous sandstone, thickly interspersed with thin laminæ of talc; its colour is light gray; fracture uneven; texture loose; it is liable to disintegration.

No. 10. Argillaceous sandstone, irregularly slatose; its colour is gray, with a tinge of yellow. Nodules of clay ironstone occur in considerable quantities through the mass of rock.

No. 11. Fine-grained argillaceous sandstone, composed of quartz and magnesia united by an argillaceous cement. Its colour is yellowish gray, which by the action of the blow-pipe passes into reddish brown. This rock contains great numbers of the impressions of the phytolites.

No. 12. Indurated clay; its colour is bluish gray, structure slatose; fracture approaching uneven; hardness inconsiderable. Impressions of small leaves occur in this, but are not numerous; they apparently consist of one species alone.

No. 13. Compact argillaceous sandstone; composed of quartz, felspar, and their laminæ of talc, united by an argillaceous cement; its colour is brownish gray. Nodules of clay iron-stone occur in considerable abundance in this rock; they are formed by concentric layers, around a nucleus, which is the same in composition as the mass of their bed. Their size varies from that of a nut to an apple.

From *Mr. Jessup's* MS. Report.— JAMES.

[PART II][98]

Containing the Calculations of Observations made by Major Long and Lieutenant Swift, on a tour from the Council Bluffs on the Missouri river, westward along the river Platte to its head waters in the Rocky Mountains,— thence southwardly to the head waters of the Arkansa and Canadian rivers,— and down said rivers to Belle Point, performed in 1820, under the command of Major S. H. Long, of the United States' Topographical Engineers.

Note.— The instruments used in making the following astronomical observations, were a portable sextant of 5 inches radius, graduated by the assistance of the vernier to 30″, made by Cary, London, accompanied by a mercurial artificial horizon with a glass frame, and an excellent patent-lever watch, by Robert Roskell.

Camp on the river Platte, at the fording place of the Pawnee Indians, twenty-seven miles below the confluence of the North and South, or Padouca Forks.

June 20, 1820.	Meridian altitude of sun's lower limb	72° 23′
	Extent of horizon, (a level sheet of water)	700 yards.
	Height of observer's eye above horizon	3½ feet.
	Index error — 4′ 15″. Latitude deduced	40° 59′ 15″ N.

Equal altitudes of Sun to find error of Watch.

	Time from Noon, A. M.	Time from Noon, P. M.	Error of Watch.
June 20, 1820.	2h 32′ 26″	2h 32′ 34″	1′ 15″ fast.
	2 29 36	2 29 46	Mean time.

Camp on the Platte, thirty-two miles below the point where it issues from the Rocky Mountains.

July 4, 1820.	Meridian double altitude of star Antaris, (α. Scorpii)	48° 10′ 00″
	Index error — 3′ 45″. Latitude deduced	39° 57′ 40″ N.

[98] The matter from this point to the end of the present volume, is reprinted from vol. ii of the Philadelphia edition (1823), where it appears as part ii.— Ed.

[xxxvii] *Observations made on the River Platte, seven minutes of latitude south of the Camp of July 4th.*

Equal altitudes of Sun to find error of watch, at noon.

	Time from Noon, A. M.	Time from Noon, P. M.	Error of Watch.
July 5, 1820.	2h 30′ 19″ 2 28 57 2 27 30	2h 21′ 17″ 2 19 55 2 18 22	8′ 41″ slow. Mean time.

A mean of eight lunar distances from sun and times correspondent, to find the longitude. Latitude by account 39° 50′ 40″ *N. Assumed longitude* 7h 01′ *W.*

	Time per Watch, A. M.	Distance of nearest limbs.	Index error.
July 5, 1820.	7h 33′ 07″	56° 09′ 26″	— 4′

Daily variation of watch 1′ 41″ losing.
Longitude deduced, 7h 01′ 23″, or 105° 20′ 45″ W. of Greenwich.

Camp at the base of the Rocky Mountains.

July 8, 1820.	Meridian double altitude of Antares	49° 17′ 30″
	Index error — 3′ 45″. Latitude deduced - - - - -	39 23 52 N.
July 9, 1820.	Meridian double altitude of Antares	49 18 15
	Index error — 3′ 45″. Latitude deduced - - - - -	39 23 29 N.
	Mean latitude of the camp -	39 23 40 N.

At our camp on Boiling-spring Creek, at the distance of about 25 miles from James's Peak, (the same designated by Pike as the highest peak,) trigonometrical observations were made for determining the height of the peak above the level of the adjacent country. A base of 1048½ feet was accurately measured, and angles taken at its extremities, to ascertain another side of the triangle, to serve as a base to determine the height of the mountain. The angles at the extremities of the primary base, corrected for the index error of sextant, were 104° 32′ 15″ and 65° 28′ 45″— and the extent of the secondary base as found by calculation, 133372.5 feet. The angles taken at the extremities of the secondary base, included between that line and the lines of vision, to an object distinctly visible at the summit of the peak, were 96° 21′ 15″ and 81° 17′ 45″, corrected as above. The angle of elevation of the top of the peak, observed at the extremity

[xxxviii] of the secondary base, most remote from the peak, was 3° 41′ 15″, corrected also for index error of sextant. The final result of these observations, gives for the height of the peak above the plain in which the observations were made, 8507½ feet.

In order to ascertain with precision, the angle of elevation of the summit of the peak, an artificial horizon of water was employed, and the double angle of elevation observed. The angle of elevation as it stands corrected for refraction, is 3° 39′ 26″. The estimate as above gives the height of the peak above the true level of the place of observation, no correction having been made for the spherical figure of the earth.

Allowing the perpendicular fall of the river Platte, from the mountains to its mouth, to be on an average nineteen inches per mile, (which appears reasonable from the rapidity of its current compared with that of the Missouri,) the fall of the Missouri from the place where it receives the Platte to its mouth, to be 16 inches per mile, which agrees with the result from *leveling* at Engineer Cantonment — and that of the Mississippi from the mouth of the Missouri to the Gulf of Mexico to be 12 inches per mile, it would give for the height of the Platte at the base of the mountains, say at the place of the above observations, 3000 feet above the level of the ocean, and consequently the height of James's Peak would be 11507½ above the same level.

This mountain was clothed in snow for a considerable distance below its summit, when the exploring party visited it, in the middle of July, and at the same time they experienced excessive heat at its base.

Observations made on the Arkansa, at our camp, situated about twenty-five miles below the point where the river issues from the mountains.

Equal altitudes of Sun to find error of watch, at noon.

	Time from Noon, A. M.	Time from Noon, P. M.	Error of Watch.
July 17, 1820.	3h 27′ 17″ 3 25 58 3 24 36	3h 08′ 35″ 3 07 15 3 05 54	15′ 03″ slow. Mean time.
July 17, 1820.	Meridian double altitude of Antares		51° 28′
	Index error — 3′ 22″. Latitude deduced - - - -		38 18 19 N.

A mean of eight lunar observations. Distance of nearest limbs of sun and moon for calculating the longitude.

	Time per Watch, P. M.	Distance of Sun and Moon.	Index Error.
July 17, 1820.	3h 26′ 49″	84° 08′ 30″	— 3′ 22″

[xxxix] Assumed longitude 7^h 01′ west. Allowance to be made for error and rate of time-piece, as before.

Longitude of Camp deduced, 7^h 02′ 39″, or 105° 39′ 45″ W.

Camp on the Arkansa, two miles below the river St. Charles, or third fork of Pike.

July 19, 1820.	Meridian double altitude of Antares	51° 36′ 00″
	Index error — 3′ 22″. Latitude deduced - - - -	38 14 18 N.

Camp on the Arkansa, at the place where the Exploring Party was divided into two detachments.

Equal altitudes of Sun to find error of watch, at midnight.

	Time before Midnight.	Time after Midnight.	Error of Watch.
July 21, 1820.	8^h 39′ 58″	8^h 17′ 50″	17′ 19″ slow. Mean time.
	8 38 38	8 16 30	
	8 37 18	8 15 10	

A mean of eight lunar distances and times correspondent,— nearest limb of moon from star Spicæ Virginis.

	Time per Watch P. M.	Distance of Moon and Star.	Index error.
July 21, 1820.	9^h 40′ 54″	51° 45′ 47″	— 3′ 30″

Variation of watch 47″ per 12 hours losing. Error of watch to be estimated. Longitude by account 6^h 58′ W. Lat. determined by subsequent observations.

Longitude of Camp, 6^h 55′ 05″ or 103° 46′ 15″ W. of Greenwich.

Equal altitudes of Sun to find error of watch, at noon.

	Time from Noon, A. M.	Time from Noon, P. M.	Error of Watch.
July 22, 1820.	2^h 58′ 21″	2^h 34′ 09″	18′ 06″ slow. Mean time.
	2 56 59	2 32 47	
	2 55 36	2 31 23	
July 22, 1820.	Meridian double altitude of Antares		51° 40′
	Index error — 3′ 30″. Latitude deduced - - - -		38 12 22 N.

[xl] *Camp on the Canadian River of August 6th.*

Aug. 6, 1820.	Meridian of altitude sun's lower limb	71° 52′
	Extent of natural horizon, or sheet of water - - - -	82 yards.
	Height of observer's eye above horizon - - - -	38 inches.
	Index error of sextant - -	— 3′
	Latitude deduced - - -	35° 16′ 19″ N.

Camp on the Canadian River of August 22d.

Aug. 22, 1820.	Meridian double altitude of moon's lower limb - - - - -	72° 18′ 15″
	Index error — 4′ 00″. Latitude deduced - - - -	35 26 29 N.

Camp on the Canadian River of August 31st.

Equal altitudes of Sun to find error of watch, at noon.

	Time from Noon, A. M.	Time from Noon, P. M.	Error of Watch.
Aug. 31, 1820.	3^h 27′ 43″	2^h 23′ 40″	31′ 52½″ slow. Mean time.
	3 26 21	2 22 18	
	3 24 55	2 20 57	

Altitudes of Sun and times correspondent, to find the Latitude.

	Times per Watch, A. M.	Double altitudes of sun's upper limb.	Index error.
Aug. 31, 1820.	10^h 29′ 20″	121° 18′ 00″	— 4′
	10 30 24	121 32 00	Error and variation of watch to be allowed.
	10 32 05	121 52 30	
	10 33 12	122 06 30	
	10 34 13	122 17 30	Lat. by account 34° 57′ N.
Mean	10^h 31′ 51″	121° 49′ 18″	
Latitude of Camp deduced from the above			34° 57′ 35″

A mean of seven Lunar distances, and times correspondent — nearest limbs of Sun and Moon.

	Time per Watch, A. M.	Distance of Sun and Moon.	Index error.
Aug. 31, 1820.	7^h 32′ 06″	77° 50′ 15″	— 4′

[xli] Allowance to be made for error and variation of watch. Longitude by account, 6^h 26′ W.

Longitude deduced, 6^h 26′ 12″, or 96° 33′ 00″ W. of Greenwich.

Camp on the Canadian river, fifteen miles above its mouth.

Sept. 9, 1820.	Meridian double altitude of sun's lower limb - - - - -	120° 13′ 00″
	Index error — 4′. Lat. deduced -	34 50 15 N.

Observations made on the Arkansa river, at Fort Smith, Belle Point, situated at the confluence of the Arkansa and Poteau rivers.

Sept. 14, 1820.	Meridian double altitude of sun's lower limb - - - - -	116° 22′ 00″
	Index error — 4′. Latitude deduced	34 51 07 N.
Sept. 15, 1820.	Meridian double altitude of sun's lower limb - - - - -	115 36 00
	Index error — 4′. Latitude deduced	34 51 00 N.
Sept. 16, 1820.	Meridian double altitude of sun's lower limb - - - - -	114 50 30
	Index error — 4′. Latitude deduced	34 50 35 N.
	Mean latitude of Belle Point	34 50 54 N.

Equal altitudes of Sun to find error of watch, at noon.

	Time from Noon, A. M.	Time from Noon, P. M.	Error of Watch.
Sept. 15, 1820.	3^h 41′ 21″ 3 38 35	3^h 36′ 32″ 3 33 46	2′ 47″ fast. Mean time.

A mean of seven lunar distances and times correspondent — nearest limbs of Sun and Moon.

	Time per Watch, P. M.	Distance of Sun and Moon.	Index error.
Sept. 15, 1820.	3^h 55′ 46″	93° 59′ 30″	— 4′

Allowance for error of watch as usual. Longitude by account, 6^h 18′ west of Greenwich.

Longitude of Belle Point deduced from the foregoing data, 6^h 17′ 24″, or 94° 21′ 00″ west of Greenwich.

[xlii] A TABLE OF LATITUDE AND LONGITUDE,

Embracing the deductions recorded in the foregoing account of Astronomical Observations and Calculations.

Places of Observation	Latitude N	Longitude W. from Greenwich	Longitude W. from Washington City
Shippingsport, Ky	38° 15′ 23″		
Camp on Mississippi, June 8	38 26 09		
Mouth of Merameg river	38 23 39		
St. Louis, Missouri	38 36 18	90° 02′ 35″	13° 02′ 35″
Camp on Missouri river, June 28	38 34 33		
Franklin, Missouri	38 57 09	92 57 05	15 57 05
Fort Osage, Missouri	39 09 33		
Cow Island, Missouri river	39 25 05		
Camp on Missouri river, Aug. 31	39 49 01		
Fort Lisa, Missouri Fur Co.'s Establishment	41 24 13		
Engineer Cantonment	41 25 04	95 43 53	18 43 53
Mouth of river Platte	41 03 13		
Mouth of Elk-horn, tributary to Platte	41 12 00		
Boyer river at commencement of High Lands	41 32 15		
Elk-horn river, near Pawnee Trace	41 26 07		
Village of Republican Pawnees	41 17 03		
Mouth of Missouri river	38 51 39	90 00 40	13 00 40
Mouth of De Moyen river	40 21 48		
Mouth of Illinois river	38 58 23	90 18 00	13 18 00
Cape Girardeau, Mississippi river	37 18 39	89 17 00	12 17 00
Spanish Fort at Natchez	31 33 45		
Camp on the Platte, July 4	39 57 40		
Do. do. July 5	39 50 40	105 20 45	28 20 45
Camp at the base of the Rocky Mountains, July 8	39 23 40		
1st Camp on Arkansa, July 17	38 18 19	105 39 45	28 39 45
Camp on Arkansa, July 19	38 14 18		
Camp where Exploring Party separated	38 12 22	103 46 15	26 46 15
Camp on Canadian river, Aug. 6	35 16 19		
Do. do. Aug. 22	35 26 29		
Do. do. Aug. 31	34 57 35	96 33 00	19 33 00
Do. do. Sept. 9	34 50 15		
Belle Point, Arkansa Territory	34 50 54	94 21 00	17 21 00

METEOROLOGICAL REGISTER

Preliminary Explanations

THE observations on the modifications of the clouds were particularly detailed in the Journal by Mr. Say, who being often remote from the party on detached expeditions, the phases observed by him cannot always be considered as precisely corresponding with those that occurred where the observations noted in the remaining columns of the tables were made by Lieut. Graham. As they would occupy too much space, if introduced into the body of this work agreeably to the manuscript notes, it was judged proper to modify and condense them into the smallest possible space. With this view, the nomenclature of Messrs. Howard and Forster has been adopted, and is now inserted in the meteorological tables, under the indications of the following abbreviations, viz.

S	-	Stratus.
C	-	Cirrus.
Cs	-	Cirrostratus—the addition of a full point, thus Cs. shows that this cloud was almost or entirely universal; and a comma, thus, Cs, indicates its partial occurrence. The same observations also relate to the signs for the following clouds.
Cm	-	Cumulus.
Cml	-	Cirrocumulus.
Cms	-	Cumulostratus.
Cmc	-	Cumulocirrostratus.
Ns	-	Nimbus.

But as the particular varieties of appearance which these respective clouds exhibited, could not be indicated in the allotted columns of the tables, they are altogether omitted. The column headed with the word *courses* indicates the points of the heavens from which the clouds proceed; thus | C. | S.W. | shows the occurrence of the Cirrus form of clouds proceeding from the south-west.

The letter L. sometimes inserted in the column of remarks on the state of the weather, indicates *lightning;* T. *thunder*, and R. *rain.*

Observations, by means of the Cyanometer, on the colour of the atmosphere, were also made, three times each day, by Mr. Graham; but as the instrument became imperfect in consequence of the fading of its colours, from the necessary exposure to the action of light, they have been rejected.

No record was made of the humidity of the atmosphere, as the Hygrometer provided for the use of the Expedition, proved entirely useless.

Simultaneous meteorological observations were made at Germantown, near Philadelphia, by Mr. Reuben Haines; from which the average temperature of that place during several months has been deduced and inserted for the sake of comparison, in the following tables.

Observations on the state of the weather were regularly made during the whole term of the expedition, but being too voluminous to be inserted in the work, it was thought best to select those of an entire year and reject the remainder.

[xliv] *Meteorological Register*

Day of Month	MORNING		MID-DAY		EVENING				REMARKS
	Temperature	Wind	Temperature	Wind	Temperature	Wind	Mean Temp.	Mean Temp. at Germantown	
1	68	N. W.	76	N. N. W.	77	W.	73	—	
2	65	Calm	77	W. N. W.	75	N. W.	72	—	
3	65	Calm	82	S. E.	80	S. S. E.	75	—	
4	72	Calm	83	Sy.	81	S.	78	68	
5	73	S.	85	S. E.	83	Sy.	80	—	
6	73	Calm	85	S. E.	84	E. S. E.	80	79	
7	79	S. W.	85	S. W.	84	Sy.	82	79	
8	78	S. S. W.	83	S. S. W.	83	S.	81	—	Windy during the day
9	75	S. W.	85	S. W.	80	W. S. W.	80	—	
10	68	S. E.	83	E. S. E.	75	S. E.	75	71	
11	64	S. S. E.	76	W. N. W.	72	N. W.	70	69	Thunder shower before day-light this morning
12	66	N. N. E.	73	N. N. W.	73	N. N. W.	70	69	
13	68	Calm	78	S. S. E.	72	S. S. W.	72	—	
14	72	S. E. by E.	81	S. by E.	80	S.	77	65	
15	77	S. by E.	84	E.	75	S.	80	—	Violent thunder gust commenced at 6 P. M. and continued till 7
16	72	S. E.	84	Calm	86	Calm	77	71	Sultry
17	80	Calm	87	Calm	86	Calm	84	76	Sultry
18	80	Calm	86	N. W. by N.	81	N. W.	82	79	Light breezes. Thermometer at 88½ at 11 o'clock, A. M.
19	69	N. E. by N.	74	N. by E.	73	N. by E.	72	78	Light breezes
20	66	W. S. W.	81	W.	80	Calm	75	68	Light breezes
21	70	S. W.	83	N. W.	83	N. by W.	78	71	Light breezes
22	70	E. by S.	83	E. N. E.	84	Calm	79	—	Light breezes
23	72	Calm	82	E. S. E.	82	S.	78	—	Light breezes
24	71	Calm	84	Calm	86	S. W.	80	70	Light showers of rain in the afternoon
25	75	Calm	85	N. E.	86	N.	82	69	Thermometer at 88 at 5 P. M. Light breezes. L. in evening
26	77	N. W.	84	S.	87	W. N. W.	82	68	Light and variable breezes
27	70	N. W. by N.	84	N. N. E.	86	N. N. E.	80	73	Light breezes
28	75	Calm	83	S. by W.	86	E.	81	76	Light breezes
29	71	Calm	88	N. W.	89	N. W. by W.	82	—	Strong breezes
30	74	N. W.	81	W. N. W.	78	S. W. by S.	77	77	Strong gales of wind last night and also during this day

[xlv] *for the Month of* JUNE, 1819

BAROMETER			MODIFICATIONS AND COURSES OF CLOUDS					
			Morning		Mid-Day		Evening	
Morning	Noon	Evening	Clouds	Courses	Clouds	Courses	Clouds	Courses
29.40	29.26	29.32						
29.36	29.17	29.31						
29.41	29.26	29.20						
29.32	29.16	29.17						
29.25	29.10	29.18						
29.29	29.15	29.16						
29.24	29.19	29.19						
29.20	29.15	29.16						
29.18	29.20	29.15						
29.28	29.21	29.20						
29.15	29.16	29.18						
29.36	29.27	29.28						
29.40	29.26	29.20						
29.29	29.16	29.15						
29.21	29.22	29.23						
29.26	29.21	29.18						
29.22	29.17	29.14						
29.16	29.13	29.14						
29.29	29.27	29.14						
29.35	29.22	29.20						
29.21	29.16	29.11	Fair	—	Cs, Cms,	—	—	—
29.22	29.19	29.13	Cs,	—	Cs. Cm,	—	Cs.	—
29.20	29.17	29.09	Fair	—	Cms.	—	Cms,	—
29.24	29.18	29.14	Fair	—	Ns,	—	Ns,	—
29.25	29.20	29.19	Fair	—	Cms,	—	Cm, Cml,	—
29.25	29.15	29.15	Fair	—	Cms, Cs,	—	—	—
29.29	29.09	29.10	—	—	—	—	—	—
29.15	29.08	29.06	Fair	—	Cml,	—	Fair	—
29.04	28.90	28.87	Cs.	—	Fair	—	Cml,	W.
29.00	28.99	29.00	Fair	—	Cm.	—	Cm, Cm,	—

[xlvi] *Meteorological Register*

Day of Month	MORNING		MID-DAY		EVENING				REMARKS
	Temperature	Wind	Temperature	Wind	Temperature	Wind	Mean Temp.	Mean Temp. at Germantown	
1	69	Calm	83	W. S. W.	83	Calm	78	—	Fresh gales in middle of the day
2	71	Calm	74	W. by S.	80	N. E. by N.	75	—	Fresh gales in middle of the day
3	67	N. N. W.	80	N.W. by N.	78	N. E. by E.	75	70	Fresh and variable brs.—night fair
4	64	N. N. W.	81	E. S. E.	77	E. S. E.	74	70	Fresh breezes
5	65	S. E. by E.	80	E. by N.	79	E. N. E.	74	69	Light breezes
6	76	Calm	81	W. S. W.	84	E. N. E.	80	69	Freq. showers of R. during the day
7	72	E. N. E.	86	N. W. by W.	86	S. E. by E.	81	65	Hard shower this forenoon
8	76	Calm	90	S. W.	88	E. N. E.	84	67	Light brs.—mackarel sky in even.
9	78	E. N. E.	83	S. W. by S.	85	S. W.	82	77	Hard shower this forenoon. L. in the evening
10	80	W. S. W.	85	N. W.				79	Rained greater part of forenoon
11	71	N. E.	85	N.W. by N.	82	S. W.	79	80	Fresh breezes this afternoon, N. N.W. horizon red after twilight. Lightning. Storm of wind
12	76	Calm	87	N. W.	81	N.W. by N.	81	79	Lightning in the evening
13	79	S.	85	W.	86	Calm	83	81	Thunder shower and heavy wind from N.W. about 1 o'clock this morning—rain 1½ inches
14	77	W. S. W.	81	N. E.	82	Calm	80	78	Thunder showers and heavy wind this morning about 1 o'clk. rain ½ inch—noon L. ¼ inch rain
15	75	W. S. W.	84	W. N. W.	82		80	81	Very light breezes
16	69	W. N. W.	77	N. W.	76	N. N. W.	74	78	Very light breezes
17	54	N. N. E.	73	S. S. E.	72	N. W.	66	73	Very light breezes. Stratus at night
18	54	N. W.	73	E. by N.	74	N. N. W.	67	70	Pleasant wea. Even. S. in N. E.
19	54	N. N. E.	75	E.	76	S. S. E.	68	72	Pleasant weather
20	64	S. E.	80	W. N. W.	73	E. by S.	72	72	Light breezes
21	68	E. by S.	75	E. by S.	70	S. S. E.	71	72	Light breezes
22	70	E.	80	S. by W.	77	S. E.	75	75	Fresh breezes. T. storm in even.
23	68	Calm	73	S. S. E.				75	Several showers of rain to-day. L. incessant in the evening
24	72	Calm	83	S. E.	82	N. E.	79	75	Fr. brs. T. storm with R. in even.
25	72	N.W. by N.	83	N. N. E.	80	N. by W.	78	76	Fresh breezes. Light rain this morning. L. in the evening
26	65	Calm	83	N.	72	W.	73	76	Fresh breezes
27	64	N. W.	84	S. S. E.	75	E. S. E.	74	76	Thick fog over the river this morn.
28	69	E.	86	S. by E.	84	N. E.	79	78	Strong breezes in the afternoon. Evening L. and shower at night
29	72	E. N. E.	88	S. W. by S.	80	S.	80	77	Strong breezes
30	74	W. S. W.	89	E. S. E.	83	S. E. by E.	82	82	Moderate brs. Noon T. Even. L.
31	72	N.E.by N.	86	N. N. W.	82	E. by N.	80	86	Moderate breezes

Remarkable Phenomena.—On the 7th, 170 miles from mouth of Missouri river at 9 o'clock, P. M. discovered a comet bearing nearly N. W. Observed its distance from North Star to be 49° 38′.—8th, 57 minutes past 8 P. M. observed distance of comet from North Star 48° 46′, bearing at same time N. 43°, W. Altitude 7°.

[xlvii] *for the Month of* JULY, 1819

BAROMETER			MODIFICATIONS AND COURSES OF CLOUDS					
			Morning		Mid-Day		Evening	
Morning	Noon	Evening	Clouds	Courses	Clouds	Courses	Clouds	Courses
29.09	29.00	29.00	Cms,	—	Cml,	—	Cs.	—
29.16	29.18	29.18	Cs.	—	Cs.	—	Cs.	—
29.33	29.20	29.20	Cs,	—	Cs,	—	Cs,	—
29.39	29.20	29.20	Cm,	S.	Cm, & C,	S.	C, & Cs,	—
29.25	29.08	29.07	Cmc.	—	Cm, Cms, Cs,	S. E.	Ns,	—
29.07	29.05	29.06	Ns.	—	Ns,	—	Cms,	—
29.12	29.00	29.02	Cms, &Cs,	—	Cs, & Cms,	—	Cm, & Cs,	—
29.04	28.96	28.96	Cs,	E.	Cm. & Cs.	—	Cml,	—
29.04	29.00	28.98	Cs.	—	Cs. Cms,	—	Ns, Cms,	N. W.
28.99	29.05		Ns.	—	Cms.	—	Cs.	—
29.18	29.10	29.04	Cs.	S. W.	Ns.	—	Ns.	—
29.00	28.97	29.04	Ns, Cs,	S. W.	Cs.	—	Ns.	N.
29.07	29.00	29.03	Cs, Ns,	NW.,NE.	Cms, Ns.	S. W.	Ns, Cs,	E.
29.03	29.13	29.13	Cs,	—	Ns.	—	Ns,	N.N.E.
29.22	29.21	29.23	S.	—	Cs, Cm,	—	Cs,	—
29.27	29.27	29.25	C, Cs,	W. N. W.	Cms,	—	Cs,	—
29.34	29.31	29.31	Cms,	—	Cms.	—	Cs,	—
29.34	29.34	29.31	S	—	Cs,	—	Cs.	—
29.34	29.34	29.34	Cmc.	—	Cs.	—	Cs.	—
29.34	29.30	29.24	Cs.	—	Cm, Cs,	—	Cs.	—
29.21	29.15	29.15	Ns.	—	Ns, Cm,	S. W.	—	—
29.06	28.97	28.97	Ns.	S.	Cms, Cml,	—	Ns	S. W.
29.00	29.00		Ns.	—	Cs, Cml,	N.W.,S.	Cm, Ns,	S. S. W.
29.02	29.10	29.12	Cm, Cs,	—	Cms, Cs,	N. N. W.	Ns,	—
29.16	29.17	29.16	Cms,	N. N. W.	Cm,	N. N. W.	C,	N. W.
29.20	29.20	29.13	C, Cml,	—	Fair	—	Fair	—
29.13	29.13	29.06	S.	—	Fair	—	Fair	—
29.10	29.10	29.06	C,	—	Cms,	—	Cms,	—
29.12	29.06	29.03	C,	N.	Cs, C,	—	Cs, Cms,	—
29.08	29.01	29.00	Ns.	—	Cms, Cml,	S. W.	Cms, Cs,	—
29.00	28.90	28.88	Ns	—	Cms. Cs	NE., S.W.	—	—

17th—Franklin, Missouri—Magnetic intensity 26 oscillations per minute.
28th—At our Camp—Magnetic intensity 25 oscillations per minute.

[xlviii] *Meteorological Register*

Day of Month	MORNING		MID-DAY		EVENING				REMARKS
	Temperature	Wind	Temperature	Wind	Temperature	Wind	Mean Temp.	Mean Temp. at Germantown	
1	72	N. W.	85	N.	82	S. E.	79	88	
2	69	Calm	78	E. by S.	74	E. by S.	73	86	
3	68		82	S. W.	74	W. by S.	74	78	Frequent showers of rain, 1-8 of an inch rain since yesterday morn.
4	73	S.	84	S.	78	W.	78	76	Frequent showers of rain, ½ an inch of rain since yesterday morning
5	68	S. S. W.	86	W.	76	S. W.	76	75	Light sprinkles of rain
6	71	W.	88	W.	80	W.	79	75	Cloudy all day
7	71	S. W.	84	W. S. W.	81	W. S. W.	78	79	Light sprinkles of rain last night and this afternoon
8	71	Calm	84	N. E.	80	S. W. by S.	78	82	Sprinkles of rain this forenoon
9	70	S. S. W.	88	Calm	84	Calm	80	80	Sultry
10	70	S. S. E.	88	S.	84	E. S. E.	80	82	Sultry. Light. in S. E. this evening
11	72	E. N. E.	90	S. S. E.	85	E. S. E.	82	79	Pleasant brs. L. in N. this evening
12	72	Calm	92	W.	85	E. N. E.	83	81	Fresh breezes. Lightning in N. W.
13	75	Calm	91	S. W.	86	S. S. E.	84	82	Fresh breezes. Night meteors shooting to the north
14	77	Calm	93	S	87	S.	85	82	Fresh breezes. No dew
15	76	S. E.	92	S.	86	S. S. W.	84	79	Light breezes. No dew
16	76	Calm	90	Calm	87	N.	84	72	Light breezes. Shower of rain in the morn. No dew in the even.
17	74	E. N. E.	90	N. E.	86	N. N. E.	83	79	Light breezes
18	73	W. S. W.	86	Calm	81	E. N. E.	89	72	Light brs. noon. Rain in the E.
19	74	Calm	83	E. N. E.	80	E. N. E.	79	74	
20	76	S. S. E.	85	E.	81	E.	80	76	
21	68	Calm	84	W. N. W.	78	N. W.	76	77	Hard shower of rain from North—3-16 of an inch of rain
22	61	N. W.	76	N. N. E	68	N. N. W.	68	78	Windy
23	50	W.	72	Calm	67	N. W.	63	70	
24	54	S. S. E.	73	S. S. E.	70	S. S. E.	65	66	Windy
25	60	S. E.	83	S. S. E.		S. S. E.		62	Strong gale of wind during the day
26	68	S.	86	S. S. E.	80	S. S. E.	78		Strong gale of wind. Evening, rain
27	71	E.	70	N.	69	N.	70	64	Strong gale of wind. Morn. rain
28	50	N. W.	79	N. W.	66	E. N. E.	65	65	Strong gale of wind
29	50	N. N. E.	75	E. S. E.				70	Fresh breezes
30	50	E. S. E.	84	S. S. W.	71	S. W.	68	69	Fresh breezes
31	62	S.	93	W. S. W.	84	S. W.	79	71	Windy

Remarkable Phenomena.— On the evening of the 2d, when the moon was about 8° above the horizon, brilliant rays of light appeared very distinctly to proceed from a point 5° or 6° to the north of the moon. Same phenomenon on the evening of the 3d.

[xlix] *for the Month of* AUGUST, 1819

BAROMETER			MODIFICATIONS AND COURSES OF CLOUDS					
			Morning		Mid-Day		Evening	
Morning	Noon	Evening	Clouds	Courses	Clouds	Courses	Clouds	Courses
28.87	28.77	28.74	Ns.	N. E.	Cml.	N. E.	Cs.	—
28.72	28.68	28.68	Ns.	—	Ns.	—	Ns.	—
28.68	28.70	28.74	Ns.	—	Ns.	—	Ns.	—
28.79	28.77	28.77	Ns.	E.	Cm,	—	C, Cs.	—
28.83	28.80	28.80	—	—	—	—	—	—
28.86		28.85	Cs.	—	Cs.	—	Cs.	—
28.90	28.82	28.82	Ns.	—	Cs.	—	Cms.	—
28.82	28.74	28.74	Ns.	—	Cs.	—	Cms.	—
28.75	28.74	28.74	Cs, Cms,	—	Fair	—	Cm,	—
28.80	28.80	28.80	Fair	—	Cm.	S. S. W.	Fair	—
28.86	28.86	28.78	Fair	—	Cm,	S. S. W.	C, Cs,	—
28.84	28.80	28.74	Cs.	—	Cs, Cms,	—	Cs,	—
28.77	28.70	28.70	Cm, Cs,	—	Cm,	—	Cm, Cs,	—
28.70	28.63	28.62	—	—	—	—	—	—
28.62	28.60	28.57	—	—	—	—	—	—
28.57	28.63	28.64	Ns.	N. W.	Ns.	—	Ns, Cs,	—
28.66	28.66	28.66	Cs,	—	Cs,Cml,	S.W.,N.E.	—	—
28.70	28.67	28.67	Cs,	—	Cs, Cm,	S.W.,N.E.	Ns.	E.
28.74	28.74	28.74	Ns.	—	Cms.	N. E.	—	—
28.80	28.75	28.68	Fair	—	Cm, Cs,	—	C.	—
28.68	28.63	28.66	Ns.	—	Ns.	—	—	—
28.84	28.85	28.88	—	—	—	—	—	—
29.18	28.85	28.85	Cs.	—	—	—	—	—
28.85	28.77	28.77	Cs.	—	—	—	—	—
28.83	28.65	28.65	C,	—	C,	E.	C,	E.
28.72	28.66	28.63	Cs,	—	Cs, Cm,	S. W.	Ns.	—
28.63	28.75	28.75	Ns.	N. W.	Cs, Cm,	W., N.W.	—	—
28.94	28.78	28.79	Fair	—	Cs.	—	—	—
29.00	28.84		—	—	—	—	—	—
28.97	28.67	28.54	—	—	—	—	—	—
28.57	28.44	28.45	Cs,	—	Fair	—	Fair	—

Fort Osage, August 4th, magnetic intensity 26½.
Fall of rain on the 26th instant 3-16ths of an inch—27th ½ an inch.

[1] *Meteorological Register*

Day of Month	MORNING		MID-DAY		EVENING		Mean Temp.	Mean Temp. at Germantown	REMARKS
	Temperature	Wind	Temperature	Wind	Temperature	Wind			
1	75	N. W.	92	S. S. E.	88	S. W.	85	75	Windy
2	75	N. W.	88	E. S. E.	74	Calm	79	78	Light breezes. Lightning in S. W. at midnight
3	63	S. S. E.	90	S. W.	78	S. W.	77	80	Hard thunder shower from W. S. W. this afternoon, lightning in N. W. in the evening
4	76	S. W.	90	S. S. E.	82	S. S. E.	82	78	Some rain last night
5	71	N. N. W.	70	N. N. W.	71	N. N. W.	70	79	Rain and lightning last night, and a shower at noon
6	66	S. E.	84	N. W.	72	N. W.	74	79	Thunder storm from S. E. last night, and another from N. W. this afternoon, and during part of the night, with rain, and some hail in the night
7	70	N. W.	85	E. S. E.	78	N. N. W.	77	80	Violent thunder storm from N. N. W. with a little hail this afternoon
8	65	N. E.	85	E. S. E.	76	E. S. E.	75	80	
9	65	E. S. E.	92	S. E.	75	S. E.	74	77	Thunder in the W. and some appearance of rain this afternoon —evening lightning in the N.
10	70	Calm	87	S. S. E.	80	S. E.	79	70	
11	72	Calm	77	S.	76	S. E.	75	65	Frequent light sprinkles of rain to-day, rain in the morning
12	74	S. S. E.	82	S.	76	Calm	77	68	
13	62	N.	74	N. N. W.	67	N. N. W.	67	62	Very windy and squally all day
14	50	W.	69	E. N. E.	60	E. N. E.	59	59	Cool breezes. S. from river at night
15	50	S. W.	74	S. S. W.	68	S. S. W.	64	64	Remarkably clear sky all this day
16	56	N. E.	78	S.	71	S.	68	65	Remarkably clear sky all this day
17	55	S.	85	E. N. E.	78	E. N. E.	72	65	Remarkably clear sky all this day
18	58	Calm	90	S. E.	75	S. E.	74	66	
19	56	N. N. W.	84	S. E.	72	S. E.	70	66	
20	58	S. E.	70	S. E.	69	S. S. W.	65	60	Night S. from the river and nimbus in N. W. horizon
21	56	E. S. E.	80	E. S. E.	74	S. E.	70	56	Fresh gales of wind
22	60	E. S. E.	76	S. E.	72	Calm	69	62	Atmosphere thick and smoky
23	54	N.	64	N. N. W.	58	N. W.	58	68	Windy
24	41	N.	64	N.	55	Calm	53	68	Windy
25	34	Calm	70	Calm	59	Calm	54	66	Frost last night
26	45	S. E.	82	S. E.	71	S. E.	66	62	Atmosphere very smoky, occasioned by the neighbouring prairies being on fire
27	54	Calm	80	S. E.	67	S. E.	67	61	
28	54	E. S. E.	77	S. E.	70	S. E.	67	60	
29	54	E. S. E.	85	S. E.	80	S. E.	73	60	
30	62	Calm	86	N. W.	73	N. W.	73	66	

Note. The Expedition arrived at ENGINEER CANTONMENT, their wintering post, on the 17th instant.

[li] *for the Month of* SEPTEMBER, 1819

BAROMETER			MODIFICATIONS AND COURSES OF CLOUDS					
			Morning		Mid-Day		Evening	
Morning	Noon	Evening	Clouds	Courses	Clouds	Courses	Clouds	Courses
28.45	28.40	28.40	C,	—	C, Cm,	—	Cs,	—
28.41	29.20	29.20	Fair	—	Fair	—	Fair	—
28.70	28.47	28.47	C, Cs,	S. W., W.	Cs.	N. W.	Ns.	S. W.
28.47	28.47	28.47	C,	S. W.	Fair	—	Cs,	W.
28.63	28.58	28.58	Cs.Cml,	W., N. W.	Ns.	S. E.	Ns.	S.
28.58	28.50	28.50	Cs.Cml,	N. W., S.	Cs,	—	Ns.	—
28.50	28.44	28.44	Ns,	—	Cm.	—	Ns.	—
28.56	29.60	29.60	Fair	—	Fair	—	Cs,	—
28.65	28.55	28.55	C, Cm,	—	C, Cm,	—	Ns,	—
28.68	28.68	28.68	Fair	—	Cm,	—	Cm. Cs,	—
28.66	28.66	28.63	Ns.	—	Ns.	—	Ns.	—
28.63	28.64	28.64	Ns.	—	Ns.	—	Fair	—
28.76	28.84	28.84	Ns.	—	Cs.	—	Fair	—
29.10	28.92	28.86	Fair	—	Cm,	—	Fair	—
28.92	28.70	28.68	Fair	—	Fair	—	Fair	—
28.75	28.64	28.65	Fair	—	Fair	—	Fair	—
28.75	28.60	28.60	Fair	—	Fair	—	Fair	—
28.60	28.50	28.50	Fair	—	Cs,	N. W.	Fair	—
28.70	28.68	28.68	Fair	—	Fair	—	Fair	—
28.80	28.70	28.70	S, Ns,	—	S, Cml,	—	S.	—
28.70	28.54	28.54	S, Cs,	—	Cs,	N. W.	Cs,	—
28.56	28.46	28.56	C, C,	—	Cs,	—	Cs,	N. W.
28.66	28.66	28.66	Cs,	N. W.	Cs,	N. W.	Fair	—
28.78	28.57	28.57	Fair	—	Fair	—	S,	—
28.80	28.54	28.54	Fair	—	Fair	—	Fair	—
28.50	28.37	28.37	Fair	—	Fair	—	Fair	—
28.37	28.43	28.43	Fair	—	Fair	—	Fair	—
28.70	28.64	28.64	Fair	—	Fair	—	Fair	—
28.65	28.50	28.50	—	—	—	—	—	—
28.50	28.54	28.50	Cs,	—	Fair	—	Cs,	N. W.

September 3d, fall of rain 7-8 inch—4th, 1-8 inch—5th, 5-8 inch—7th, 3-8 inch—8th, 5-8 inch.

[lii] *Meteorological Register*

Day of Month	MORNING		MID-DAY		EVENING		AT ENGINEER CANTONMENT		
	Temperature	Wind	Temperature	Wind	Temperature	Wind	Mean Temp.	Mean Temp. at Germantown	REMARKS
1	46	Calm	86	N. W.	74	N. W.	68	65	Atmosphere thick with smoke
2	50	Calm	73	E.	65	E.	62	—	Atmosphere thick with smoke
3	54	S. E.	75	S. E.	72	Calm	67	—	Atmosphere thick with smoke
4	64	E. S. E.	90	S. E.	86	S. E.	80	56	Atmosphere thick with smoke
5	72	S. E.	88	S. S. E.	82	S. S. E.	80	60	Windy and squally. Atmosphere thick with smoke
6	68	S. E.	71	S. E.	47	N. W.	62	66	Light rain this morning
7	36	N. W.	39	N. W.	38	N. W.	37	66	Windy
8	32	N. W.	38	N. W.	36	N. W.	35	67	A little ice and snow last night. Windy and light snow this even.
9	31	N. W.	48	N. W.	44	N. W.	41	70	Frost last night—windy to-day
10	38	S. E.	68	N. N. W.	55	N. N. W.	53	58	Windy
11	35		56	E. S. E.	52	E. S. E.	47	53	Light sprinkles of rain to-day
12	43	Calm	53	N. E.	49	Calm	48	54	Fresh breezes of wind all this day
13	28	Calm	57	S. E.	47	Calm	44	46	Frost last night
14	42	S. E.	70	S. E.	62	Calm	58	47	
15	44	N. N. E.	58	N. N. E.	53	N. W.	51	52	
16	30	N. W.	53	N. W.	42	W.	41	57	Frost last night
17	26	S. E.	59	E. S. E.	51	S. E.	45	49	Frost last night—water also froze in a vessel left out
18	43	N. N. W.	57	W. N. W.	53	W. N. W.	51	46	Windy
19	40	N. W.	53	N. W.	45	N. W.	46	46	High wind this day
20	29	Calm	53	N. W.	45	W. N. W.	42	47	Hail last night
21	28	Calm	49	S. E.	46	S. E.	41	48	Heavy frost last night
22	38	Calm	74	Variable	65	N. W.	59	42	High wind this afternoon. Fog on the river this morning
23	40	N. W.		N. W.		N. W.		46	High winds
24		N. W.		N. W.		N. W.		48	High winds
25		S. S. W.		S. S. W.		S. S. W.		39	High winds
26	29	Calm	56	S. E.	54	S. E.	46	42	
27	32	Calm	59	Calm	56	Calm	49	50	
28	32	Calm	68	S. S. W.	66	S. S. W.	55	53	
29	39	Calm	61	N.	57	N.	51	52	Frost last night, smoky atmosphere to-day
30	31	Calm	52	S. E.	54	S. E.	45	52	Atmosphere filled with dense smoke
31	50	N. W.	77	N. W.	61	N. W.	62	43	Atmosphere filled with dense smoke

Remarkable Phenomena.—The Aurora Borealis appeared in N. N. E. at 8 o'clock on the evening of the 12th, near the horizon, and continued but a short time.

The atmosphere has been very thick with smoke during this month generally, occasioned by the burning of the *prairies*. This appearance has generally been near

[liii] *for the Month of* OCTOBER, 1819

BAROMETER			MODIFICATIONS AND COURSES OF CLOUDS					
			Morning		Mid-Day		Evening	
Morning	Noon	Evening	Clouds	Courses	Clouds	Courses	Clouds	Courses
28.73	28.54	28.56	Cml,	N. W.	Fair	—	Fair	—
28.74	28.62	28.62	Fair	—	Fair	—	Fair	—
28.54	28.45	28.38	Fair	—	Fair	—	Fair	—
28.38	28.28	28.28	Fair	—	Fair	—	C,	S. W.
28.38	28.35	28.35	Cml,	—	Cm,	—	C,	—
28.40	28.33	28.40	Ns.	S. W.	Ns.	—	Ns.	—
28.70	28.80	28.87	Ns.	—	Ns.	—	Ns.	—
28.96	28.94	28.94	Ns.	—	Ns.	—	Ns.	—
28.88	28.83	28.72	Fair	—	C,	—	Fair	—
28.71	28.66	28.67	C,	—	C, Cml,	—	Ns.	—
28.88	28.88	28.96	Fair	—	Ns.	—	Ns.	W.N.W.
29.21	29.20	29.23	Ns.	—	Cs,	N. W.	Cml,	—
29.45	29.28	29.25	Fair	—	Fair	—	Fair	—
29.16	28.90	28.83	Fair	—	Fair	—	Fair	—
28.69	28.64	28.65	C,	N.	Cml,	—	Cml,	—
28.87	28.78	28.78	Fair	—	Fair	—	Fair	—
28.90	28.75	28.75	Fair	—	C,	W.	C,	N.W.
28.64	28.61	28.61	C,	N. W.	Cm,	N. W.	Ns,	N. W.
28.76	28.76	28.76	Cm,	N. W.	Cm,	N. W.	Ns.	—
28.95	28.95	29.00	Cm,	—	Cm,	—	Cm.	—
29.16	29.00	28.88	Cs,	N. W.	Cs,	N. W.	Fair	—
28.66	28.35	28.45	C,	N. W.	C,	—	Fair	—
28.78			C,	—	C,	—	C,	—
			Cs.	—	C,	—	C,	—
			C,	—	Fair	—	Fair	—
28.92	28.88	28.90	C,	N. W.	C,	—	Fair	—
28.94	28.88	28.88	C,	N. W.	C,	N. W.	C	N. W.
28.96	28.73	28.67	Fair	—	Fair	—	Fair	—
28.83	28.74	28.69	—	—	—	—	—	—
28.88	28.73	28.64	—	—	—	—	—	—
28.48	28.48	28.48	C,	N. W.	C,	N. W.	C,	N. W.

the horizon, but at some times, particularly in the latter part of the month, the whole of the sky has been obscured by smoke, bearing much resemblance in the morning, when there was little wind, to a thick fog.

6th — Fall of rain 3-16ths of an inch.

[liv] *Meteorological Register*

Day of Month	MORNING		MID-DAY		EVENING				AT ENGINEER CANTONMENT
	Temperature	Wind	Temperature	Wind	Temperature	Wind	Mean Temp.	Mean Temp. at Germantown	REMARKS
1	52	N. W.	63	N. W.	54	N. W.	56	—	Windy and boisterous
2	33	S. E.	65	Var.	60	N. W.	52	50	Strong winds. Gust at 2 P. M.
3	44	N. W.	54	N. W.	53	N. W.	50	49	Windy
4	32	Calm	64	N. W.	58	N. W.	51	47	Windy
5	44	S. E.	54	S. E.	57	S. E.	51	44	Windy. Atmos. dense with smoke
6	46	N. W.	50	N. W.	47	N. W.	47	43	Very windy and boisterous
7	30	S. E.	54	S. E.	56	S. E.	46	50	Windy
8	47	S. E.	68	S. E.	56	S. E.	57	—	Light wind. Atmos. very smoky
9	30	Calm	40	N. W.	44	N. W.	38	47	Light wind. A little rain at evening, with thunder and lightning
10	57	S.	58	S.	54	S.	56	48	Rainy until noon
11	36	Var.	53	S.	52	S.	47	49	Light brs. Atmosphere very clear
12	38	N. W.	40	N. W.	36	N. W.	38	56	A little rain last night
13	38	S. E.	41	S. E.	43	S. E.	40	50	Fresh breezes
14	38	S. E.	64	Calm	48	Calm	50	41	Mild weather
15	45	S. E.	56	S. E.	50	N. W.	50	37	Mild. At sunset wind N.W.
16	33	Calm	52	N. W.	50	N. W.	45	50	Frost last night. Light winds
17	34	S. E.	46	S. E.	43	Calm	41	59	Frost last night
18	24	Calm	42	Sy.	43	S. E.	36	47	Heavy frost last night.
19	44	S. E.	61	Sy.	61	Sy.	55	43	Moderate wind
20	39	N.	43	N.	41	N.	41	—	Windy
21	36	S. E.	38	S. E.	39	S. E.	37	47	Rain before daylight
22	40	N. W.	42	N. W.	40	N.	40	38	Rain last night
23	37	E.	39	S. E.	42	S. E.	39	46	Rain last night. Ground covered with sleet in the morning
24	35	W.	43	W.	44	W.	40	—	Rainy last night
25	36	S. E.	39	S. E.	43	S. E.	39	48	Heavy frost last night. Lit. rn. even.
26	18	N. W.	22	N. W.	23	N. W.	21	48	Snow 1-8 in. Little ice in river
27	10	Calm	20	S. E.	25	S. E.	18	51	Much floating ice in river
28	20	S. E.	34	S. E.	36	S. E.	30	39	Frost last night
29	29	S. E.	40	S. E.	40	S. E.	36	—	Floating ice increasing in river
30	30	Calm	55	Calm	42	Calm	42	35	Floating ice increasing in river Fair

Remarkable Phenomena.—The atmosphere continued its smoky appearance until the 11th, appearing to be produced by southerly and south-easterly winds, and carried off by north and north-westerly ones.

[lv] *for the Month of* NOVEMBER, 1819

BAROMETER			MODIFICATIONS AND COURSES OF CLOUDS					
			Morning		Mid-Day		Evening	
Morning	Noon	Evening	Clouds	Courses	Clouds	Courses	Clouds	Courses
28.70	28.63	28.73	Fair	—	Fair	—	Fair	—
28.75	28.45	28.50	C.	N. W.	C,	N. W.	C,	—
28.65	28.67	28.66	C,	N. W.	C,	N. W.	C,	N. W.
28.53	28.49	28.49	Cms,	N. W.	C,	—	C,	—
28.50	28.18	28.09	C,	W.	—	—	—	—
28.65	28.71	28.82	C,	—	C,	—	C,	—
28.95	28.64	28.48	Cs,	N. W.	—	—	—	—
28.35	28.22	28.30	—	—	—	—	—	—
28.68	28.60	28.60	—	—	—	—	Ns.	—
28.35	28.13	28.13	Ns.	—	Ns.	S. S. E.	Cml,	S. S. E.
28.53	28.53	28.47	Fair	—	Fair	—	Fair	—
28.59	28.80	28.80	Ns,	N. W.	Ns.	—	Ns.	—
28.89	28.70	28.56	Ns,	S. E.	Cs,	—	C,	—
28.41	28.33	28.35	C,	—	C,	N. W.	Cs,	—
28.10	27.90	28.10	Cs,	W.N.W.	C,	—	Cs,	W.
28.44	28.43	28.47	Fair	—	C,	N. W.	Cms,	—
28.60	28.46	28.51	C,	N. W.	Cs,	N. W.	Cs,	N. W.
28.90	28.70	28.56	Cs,	N. W.	Ns,	N. W.	Ns,	N. W.
28.30	28.21	28.31	Cs,	W.	Cs,	W.	C,	W.N.W.
28.75	28.76	28.80	Cs.	—	C,	W.N.W.	Cs,	—
28.94	28.83	28.76	Ns.	—	Ns.	—	Ns.	—
28.83	28.92	28.97	Ns,	N. W.	Ns,	N. W.	Ns.	N. W.
28.95	28.69	28.57	Ns.	S. E.	Ns.	—	Ns.	—
28.54	28.55	28.62	C,	S. W.	Fair	—	Fair	—
28.72	28.60	28.55	Ns.	S. W.	Ns.	—	Ns.	—
29.13	29.08	29.13	Cml,	N. W.	Cml,	N. W.	Cml,	N. W.
29.43	29.25	29.21	Fair	—	Fair	—	Fair	—
29.14	29.08	28.95	Fair	—	Fair	—	Fair	—
29.02	28.91	28.87	Fair	—	Cml,	N. W.	Cs,	—
28.85	28.77	28.77	Fair	—	C,	N. W.	C,	N. W.

November 10th, fall of rain ½ inch—23d, ¾ inch—24th, ½ inch.

[lvi] *Meteorological Register*

Day of Month	MORNING		MID-DAY		EVENING		AT ENGINEER CANTONMENT		REMARKS
	Temperature	Wind	Temperature	Wind	Temperature	Wind	Mean Temp.	Mean Temp. at Germantown	
1	34	Calm	51	N. W.	46	N. W.	43	37	Thawing
2	32	S. E.	41	S. E.	43	S. E.	38	34	No floating ice in river
3	32	S. E.	53	S. E.	49	S. E.	44	30	Thawing
4	34	E.	39	E.	39	E.	37	39	Frost last night
5	33	S.	40	Calm	43	Calm	38	32	Rain at mid-day
6	42	S. E.	45	S.	42	S.	43	34	Drizzling, A. M.
7	36	S. E.	44	Calm	43	Calm	41	43	Frost last night
8	38	N. W.	42	N. W.	39	N. W.	39	45	Light winds
9	23	S. E.	32	S. E.	32	S. E.	29	42	Heavy frost last night
10	32	S. E.	34	S. E.	34	S. E.	33	—	Windy
11	31	S. E.	36	S. E.	34	S. E.	33	27	Windy
12	34	Calm	36	Calm	36	Calm	35	29	A little snow, hail, and rain last night. Float. ice this morn.
13	28	N. W.	32	N. W.	26	N. W.	28	30	Floating ice in river
14	20	N. W.	28	N. W.	24	N. W.	24	34	Floating ice in river
15	15	N. W.	20	N. W.	19	N. W.	18	33	Frost last night. Much floating ice this morning
16	14	S. E.	24	S. E.	21	S. E.	19	34	A little snow in flakes at noon
17	21	S. W.	35	S. W.	37	S. W.	31	34	Frost last night
18	29	N. W.	28	N. W.	27	N. W.	28	33	Very windy
19	11	N. W.	38	N. W.	24	N. W.	24	45	Snow ¼ inch last night
20	17	S. E.	55	S. E.	42	S. E.	38	39	Thawing
21	35	S. E.	19	N. W.	17	N. W.	23	35	Very high wind
22	1	N. W.	3	N. W.	1	N. W.	1	35	Ice made across river last night
23	—10	N. W.	3	N. W.	1	N. W.	—2	40	A little snow fell yesterday
24	— 8	S. W.	15	S. W.	19	S. W.	9	43	River entirely closed with ice
25	18	Calm						28	Stratus in horizon at midnight
26	20	N. W.	43	N. W.	35	N. W.	32	28	Frost last night
27	9	Calm						32	Frost last night
28	12	N. W.	21	N. W.	11	N. W.	14	25	Windy, slight snow. Icy particles in the air
29	4	S. E.	25	Calm	16	Calm	15	24	Frost last night
30	— 4	N. W.	2	N. W.	— 1	N. W.	—1	16	A little snow last night
31	— 4	S. E.	15	S. E.	19	N. W.	10	14	Snow ¼ inch to-day

Remarkable Phenomena.— December 30th. This morning at sun-rise there appeared two images of the sun about 22° or 23° N. and S. of, and in a horizontal line with the sun; the whole sky being obscured by dense cloud: neither the images nor the sun appeared very distinct, but presented the appearance of luminous spots. The appearance continued until about 11 o'clock.—This evening at half past five o'clock,

[lvii] *for the Month of* DECEMBER, 1819

BAROMETER			MODIFICATIONS AND COURSES OF CLOUDS					
			Morning		Mid-Day		Evening	
Morning	Noon	Evening	Clouds	Courses	Clouds	Courses	Clouds	Courses
28.94	28.80	28.88	Cs,	N. W.	C,	—	Fair	—
28.90	28.85	28.72	Cs,	—	Cs,	—	Fair	—
28.56	28.55	28.63	Fair	—	Fair	—	Fair	—
28.88	28.78	28.80	C,	N. W.	C,	W.	Cs,	—
28.85	28.61	28.61	Ns,	S.	Ns.	—	Ns.	—
28.74	28.63	28.70	Ns.	—	Ns.	N. & S.	Ns,	—
28.87	28.73	28.74	C,	W.N.W.	Cs,	W. N. W.	Cs,	—
28.84	28.89	29.02	Ns.	W.	Ns.	—	Cml,	N. W.
29.28	29.00	28.97	C,	N. W.	C,	N. W.	C,	N. W.
28.77	28.60	28.58	Ns.	S. E.	Ns.	—	Ns,	—
28.75	28.70	28.70	Ns.	S. E.	Ns.	S. E.	Ns.	S. E.
28.57	28.44	28.44	Ns.	—	Ns.	—	Ns.	—
28.47	28.36	28.46	Cml.	W.N.W.	Ns.	N. W.	Ns.	N. W.
28.78	28.80	28.83	Ns.	N. W.	Ns.	N. W.	Ns.	N. W.
29.25	29.14	29.08	Fair	—	Cml,	N. N. W.	Ns.	—
29.09	29.04	28.91	Ns,	—	Ns.	—	Ns.	N. W.
28.72	28.62	28.50	Fair	—	C, Cml,	NW., SW.	C,	S. W.
28.49	28.54	28.50	Ns.	—	Ns.	—	Ns.	—
28.72	28.60	28.60	Fair	—	Fair	—	C,	—
28.56	28.50	28.40	C,	—	Cs,	W. N. W.	Ns,	—
28.14	28.30	28.49	Cml,	N. W.	Ns,	N. W.	Cs,	N. W.
29.00	28.73	28.83	Ns.	—	Ns.	—	Ns.	—
29.32	29.02	29.00	Cs,	S. W.	Cs,	S. W.	C,	S. W.
28.93	28.80	28.50	Fair	—	C,	—	Cs,	N. W.
28.64			C,	N. W.	C,	—	C,	—
28.58	28.31	28.51	Fair	—	Fair	—	Fair	—
28.68			C,	—	Cs.	—	Cs.	—
28.80	28.57	28.84	Ns.	—	Fair	—	Fair	—
28.84	28.80	28.66	Cs,	N. W.	C,	N. W.	Cs,	N.
28.98	28.95	28.95	Ns,	N.	Ns,	N.	—	—
28.83	28.50	28.54	Ns.	—	Ns.	—	Cml,	N. W.

a similar phenomenon accompanied the moon.—Around her there was a halo or luminous circle of about 45° in diameter. In the circumference of this circle, on each side the moon and in a horizontal line with her, there appeared an image similar to those described of the sun, though not quite so distinct. They did not continue long.

December 5th, fall of rain 1-16th of an inch.

[lviii] *Meteorological Register*

Day of Month	MORNING		MID-DAY		EVENING			AT ENGINEER CANTONMENT	
	Temperature	Wind	Temperature	Wind	Temperature	Wind	Mean Temp.	Mean Temp. at Germantown	REMARKS
1	16	N. W.	22	N. W.	20	N. W.	19	12	Little snow fell to-day
2	13	N. W.	24	N. W.	18	N. W.	18	21	
3	4	S. E.	35	S. E.	28	N. W.	22	—	Mild and fair
4	13	N. E.	31	N. W.	21	N. W.	21	26	
5	0	S. E.	24	S. E.	19	S. E.	14	25	Fresh winds
6	20	S. E.	32	S. E.	28	S. E.	26	18	A little snow at evening
7	16	N. W.	40	Calm	35	N. W.	30	23	Thawing
8	24	N. W.	32	N. N. E.	27	N. W.	27	35	Snow in flakes at evening
9	7	N. N. W.	14	N. W.	14	N. W.	11	35	Windy. Snow ½ inch last night
10	— 8	N. W.	3	N. W.	— 3	N. W.	— 3	27	Windy. Slight snow last night
11	—16	N. W.	— 2	N. W.	— 3	N. W.	— 7	29	Moderate wind
12	7	S. E.	32	S. E.	36	N. W.	25	22	Strong wind, A. M. Little rain and snow, P. M.
13	10	N. W.	17	N. W.	13	N. W.	13	17	Snow, P. M.
14	2	N. W.	21	N. W.	— 1	N. W.	8	26	Fresh wd. Snow 6 inches last night
15	—14	N. W.	— 5	N.	— 5	N.	— 8	31	Fresh wind
16	— 9	N. W.	4	N. W.	1	N. W.	— 1	25	
17	— 9	S. E.	11	S. E.	11	Sy.	— 4	35	Snow ¼ inch at night
18	—13	N. W.	9	N. W.	1	N. W.	— 1	25	Light wind
19	1	N. N. E.	9½	N. E.	2	N. W.	4	27	Snow 1 inch last night.
20	— 5	S. E.	9	S. E.	11	S. E.	— 5	22	Windy. Snow storm from 9 A. M.
21	10	N. W.	13	N. W.	1	N. W.	8	25	Snow till 3 P. M. Snow 5 inches on 19th & 20th
22	—15	N. W.	11	N. W.	— 8	N. W.	— 4	33	Light winds
23	— 9	S. E.	11	S. E.	12	S. E.	5	29	Windy. Thermom. at 17°, P. M.
24	19	N. W.	34	N. W.	19	N. W.	20	20	
25	— 5	S. E.	23	S. E.	23	S. E.	13	30	Windy
26	26	N.½W.	33	N. W.	21	N. W	26	23	Snow last night 4½ inches
27	19	N. W.	23	N. W.	4	N. W.	15	32	Light breezes. Snow
28	—15	S. E.	9	S. E.	5	S. E.	0	36	Windy
29	6	S. E.	12	N. W.	— 3	N. W.	5	21	Windy. A lit. snow, A. M.
30	—26	S. E.	— 2	S. E.	0	N. W.	— 9	32	
31	— 2	N. W.	— 3	N. W.	—11	N. W.	— 5	30	Windy, A. M.

Remarkable Phenomena.— January 18th. This morning a parhelion appeared around the sun as he rose, consisting of a mock sun, or image of the sun on each side of him in a horizontal line. From the image northward of the sun there issued a cone of light, the vertex of which was directed from the sun. There was no halo, and the mock suns were not well defined by any outline, though the morning was fair, and the sun shone bright. At eight o'clock the distance of the mock suns from each other,

[lix] *for the Month of* JANUARY, 1820

BAROMETER			MODIFICATIONS AND COURSES OF CLOUDS					
			Morning		Mid-Day		Evening	
Morning	Noon	Evening	Clouds	Courses	Clouds	Courses	Clouds	Courses
28.58	28.77	28.87	Ns.	—	Ns.	—	Cs.	—
29.00	28.91	29.00	Ns,	—	C,	N. W.	Cs,	—
28.98	28.76	28.87	C,	N. W.	C,	N. W.	Fair	—
29.04	28.97	29.03	Cs.	—	Cs.	—	C,	W.
29.19	29.02	29.04	C,	N. W.	Fair	—	Fair	—
28.88	28.74	28.66	Cs.	N.	Ns.	—	Ns.	—
28.60	28.44	28.57	Cs,	—	C,	—	Cs,	—
28.80	28.74	28.85	Cs.	—	Ns.	N. E.	Ns.	—
29.14	29.04	29.10	Ns.	—	Ns.	—	Ns.	—
29.15	29.12	29.21	Fair	—	Fair	—	Fair	—
29.48	29.27	29.21	Fair	—	Fair	—	Fair	—
28.63	28.58	28.62	Ns.	W. N. W.	Ns.	—	Ns.	—
28.77	28.75	28.78	Ns	N. W.	Ns.	—	Ns.	—
28.97	28.97	29.13	Ns.	—	Ns.	—	C,	—
29.40	29.40	29.40	Ns.	—	Ns.	—	Ns.	—
29.22	28.98	28.96	Ns.	—	Cml.	—	—	—
28.82	28.76	28.86	Cs,	—	Ns.	—	Ns.	—
29.06	28.93	28.90	Fair	—	Fair	—	Hazy	—
28.83	28.83	28.86	Ns.	—	Ns.	—	Cs.	—
28.70	28.59	28.60	Ns.	—	Ns.	—	Ns.	—
28.85	28.99	29.15	Ns.	—	Ns.	—	Cml,	—
29.33	29.27	29.26	Fair	—	Fair	—	Fair	—
29.05	28.95	28.96	Cs,	W. N. W.	Cml,	—	Cs,	W. N. W.
29.19	29.15	29.19	Cs.	—	Cs.	—	Cs.	W.
29.08	28.95	28.84	Ns.	S. W.	Cml,	S. S. W.	Cml,	S. S. W.
28.42	28.42	28.61	Ns.	—	Cs.	—	Cs.	—
28.78	28.85	28.96	Ns.	—	Ns.	—	Cs,	—
28.90	28.77	28.80	C,	S. W.	C,	S. W.	Cs,	—
28.75	28.71	28.95	Cml,	S. E.	Cs,	N.	Cs,	—
29.07	28.95	28.93	C,	—	C,	—	Cs,	—
29.30	29.38	29.41	Cs,	W. N. W.	Cs.	—	Cs.	—

measured by a sextant, was found to be 44° 40′. At half past eight they had assumed the appearance of extended planes perpendicular to the horizon, and about 5° or 6° in length; breadth a little more than sun's diameter; soon after which they disappeared. N. B. See *Remarkable Phenomena* continued, on page lxviii [our page 288], at the conclusion of the *Meteorological Register*.

[lx] *Meteorological Register*

Day of Month	MORNING		MID-DAY		EVENING			AT ENGINEER CANTONMENT	
	Temperature	Wind	Temperature	Wind	Temperature	Wind	Mean Temp.	Mean Temp. at Germantown	REMARKS
1	—12	S. E.	— 3	S. E.	— 3	S. E.	— 6	8	A little snow, A. M. and windy
2	0	N. W.	7	N. W.	— 2	N. W.	2	21	Fresh winds
3	— 5	S. E.	13	S. E.	20	S. E.	9	33	Windy
4	4	S. E.	30	S. E.	33	S. E.	22	28	Windy. Thermom. 34°, P. M. Snow melting
5	39	S. E.	45	S. E.	19	N. W.	34	24	Thawing at noon
6	7	S. E.	35	S. E.	29	S. E.	23	40	Fresh wind. Thawing
7	4	S. E.	33	S. E.	34	S. E.	23	32	Damp & foggy. Light wds.
8	21	N. W.	33	N. E.	31	N. W.	28	35	Damp and foggy. Icy particles falling all day
9	23	S. E.	41	S. E.	31	S. E.	31	31	Snow and ice melting
10	12	S. E.	31	S. E.	38	S. E.	27	22	Snow and ice melting
11	31	S. E.	44	W.N.W.	34	N. N. W.	36	31	Snow and ice melting
12	26	N. W.	35	S. E.	31	S. E.	30	33	A little rain and snow
13	33	S. E.	46	S. E.		S. E.		49	Rain and hail last night. Windy and warm to-day
14	34	N. W.	35	N. W.	37	N. W.	35	42	Violent wind all day with a little snow
15	33	S. E.	39	S. E.	44	S. E.	38	51	Snow chiefly melted. A little snow fell
16	32	N. W.	33	N. W.	29	N. W.	34	41	Violent wind last night & to-day, with some snow
17	20	N. W.	34	S. E.	31	S. E.	28	49	Moderate winds
18	27	S. E.	30	S. E.	30	S. E.	29	38	Windy
19	26	N. W.	23	N. W.	25	N. W.	24	29	Violent wind last night
20	20	N. W.	34	N. W.	30	N. W.	28	37	Moderate wind
21	33	S. E.	51	S. E.	47	S. E.	43	32	Thermometer at 55°. Ice rapidly dissolving
22	35	N. W.	45	S. E.	37	S. E.	39	39	Fresh brs. Ice melting
23	33	N. W.	47	N. W.	38	N. W.	39	44	Windy and squally. Geese flying northwardly
24	30	S. E.	54	S. E.	39	N. W.	41	53	Light breezes. Geese passing northwardly
25	33	N. W.	44	N. W.	35	N. W.	37	45	Light breezes. Ducks passing down river
26	25	N. W.	39	N. W.	35	N. W.	33	48	Snow last night $\frac{1}{8}$th inch
27	21	N. W.	44	N. W.	40	N. W.	35	51	Frost last night
28	34	Calm	57	S. E.	49	W. N. W.	46	41	Frost last night
29	22	N. W.	60	S. E.	55	W. N. W.	45	32	Frost abundant. River begins to open

Remarkable Phenomena.— 15th, Lightning in N. E. this evening between 7 and 8 o'clock — clear sky — fresh S. E. wind. During the violent wind to-day the rain guage was blown from its station and broken.

[lxi] *for the Month of* FEBRUARY, 1820

BAROMETER			MODIFICATIONS AND COURSES OF CLOUDS					
			Morning		Mid-Day		Evening	
Morning	Noon	Evening	Clouds	Courses	Clouds	Courses	Clouds	Courses
29.06	28.87	28.81	Ns.	—	Cs,	—	Cs.	—
28.80	28.77	28.88	Cs.	—	Cml,	—	Fair	—
28.85	28.69	28.67	C,	N. W.	Cs,	—	Cs,	—
28.84	28.65	28.60	C,	N. W.	C,	W. N. W.	C,	W. N. W.
28.32	28.22	28.72	Cs,	W.	Cs,	—	Cml,	—
29.00	28.87	28.72	Cs,	—	Cs.	—	Cml,	W. S. W.
28.95	28.76	28.83	C,	—	Fair	—	C,	—
28.75	28.60	28.69	Ns. S.	—	Ns.	—	Ns.	—
28.86	28.83	28.79	Ns.	—	Ns.	—	Ns.	—
28.84	28.58	28.66	C,	—	C,	N. W.	Fair	—
28.60	28.33	28.50	C,	—	C,	—	C,	—
28.80	28.50	28.60	Cs.	—	Fair	—	C,	—
28.33	28.16		Cs,	—	C,	—	C,	—
28.24	28.26	28.33	Cs,	—	Ns.	—	Ns.	—
28.24	28.00	27.80	Cs, Cml,	SSW,SSE	Ns.	S. S. E.	Cm,	—
27.96	28.21	28.43	Ns.	N. N. W.	Ns.	—	Cs,	—
28.76	28.55	28.66	Fair	—	C,	—	C,	—
28.86	28.73	28.55	Cs.	N. N. W.	Cs,	—	Cs.	—
28.44	28.69	28.89	Ns.	—	Cml,	N. N. W.	C,	—
28.96	28.86	28.87	Fair	—	Fair	—	Fair	—
28.74	28.50	28.42	Fair	—	Fair	—	Fair	—
28.53	28.47	28.49	C,	—	C,	N. W.	C,	N. W.
28.16	28.19	28.40	Cs,	—	Cms,	—	Fair	—
28.30	28.07	28.08	Cs.	W. N. W.	Cs.	W. N. W.	C, Cs,	—
28.11	27.96	28.05	Cs,	—	Cs, Cml,	S.W,N.W.	Ns,	—
28.21	28.25	28.38	Ns,	N. W.	Cs, Cml,	W.,NNW.	Cs,	—
28.67	28.58	28.63	C,	—	Cs,	—	C,	—
28.87	28.73	28.73	Fair	—	C,	—	Fair	—
28.90	28.65	28.57	Fair	—	Fair	—	Fair	—

22d.— Halo around the moon this evening at 40′ past 6 — ascertained its diameter to be 45° 8′. Cirrus cloud all over the sky.

23d.— Halo around the moon this evening also.

[lxii] *Meteorological Register*

Day of Month	MORNING		MID-DAY		EVENING				AT ENGINEER CANTONMENT
	Temperature	Wind	Temperature	Wind	Temperature	Wind	Mean Temp.	Mean Temp. at Germantown	Rise or fall of Missouri in the last 24 hours: Inc.	REMARKS
1	20	N. W.	32	N. W.	21	N. W.	24	40	—12	Violent winds
2	16	N. W.	26	S. E.	26	Calm	22	24	+ 1	Frost last night. Icy particles falling in the morning
3	21	N. W.	28	N. W.	24	N. W.	24	24	+ 5½	Strong wind. A little snow
4	32	S. W.	50	S. E.	48	N. W.	43	31	+ 5	Frost last night. Fresh wind
5	30	N. W.	28	N. W.	25	N. W.	27	41	— 2	Very clear sky all day
6	5	N. W.	13	N. W.	9	N. W.	9	44	+ 2½	Snow ¾ inch last night
7	6	N. W.	15	N. W.	14	N. W.	11	26	+27½	Frost last night
8	15	N. W.	16	N. N. E.	12	N. W.	14	28	+20	Frost last night
9	24	N. W.	23	E. S. E.	24	S. E.	23	31	+ 4	Frost last night
10	20	Calm	35	S. E.	34	S. E.	29	33	— 5	Fresh wind. No geese, few ducks flying
11	28	S. E.	23	S. E.	25	S. E.	25	27	— 1½	Violent winds.Snow ¾ inch
12	31	S. E.	42	S. E.	37	S. E.	36	27	+ 7	Moderate winds
13	32	N. W.	46	N. W.	40	N. W.	39	34	+ ½	Rain last night
14	19	N. W.	33	N. W.	32	Calm	28	46	— 6	Frost last nt. Riv. break.up
15	22	N. W.	39	N. W.	34	N. W.	31	36	— 5	Frost last night
16	21	S. E.	51	N. W.	43	N. W.	38	40	— 3	Do. Moderate winds
17	24	N. W.	45	N. W.	36	Calm	35	43	— 3¼	Do. Light and var. winds
18	34	S. E.	61	S. E.	58	S. E.	51	40	—14¼	River open. Geese, swans, ducks, &c. flying up
19	39	N. W.	48	N. W.	41	N. W.	42	39	— 1½	A little rain, A. M.
20	25	Calm	48	N. W.	41	Calm	38	44	— 1½	A little rain, P. M.
21	25	Calm	58	N. W.	49	N. W.	44	42	+ 5	Frost. Geese, &c. flying Nly.
22	34	Calm	67	N. W.	58	N. W.	53	43	+10	Moderate wind
22	38	S. E.	65	S. E.	68	S. E.	57	48	+42	Violent wind all day
24	55	S. E.	65	S.	53	S.	57	54	+40	High wind, A.M. Showers P.M.Light.in N.E.even.
25	38	N. W.	51	N. W.	46	N. W.	45	56	+10	Drizzly, A. M.
26	38	N. W.	40	N. W.	42	N. W.	40	57	—12	Heavy rain till 7 A.M.Some rain and snow afterwards
27	29	Calm	56	S. E.	45	S. E.	43	57	+10	Frost last nt.A lit.rain P.M.
28	39	S. E.	45	E.	38	N. E.	40	50	— 4½	Rain occas.through the day
29	28	N. W.	34	N.	32	N. E.	31	51	— 6	Fresh winds
30	28	S. E.	56	S. E.	52	S.	45	34	— 2	Heavy frost last night
31	35	Calm	57	N. E.	40	N. E.	44	34	+ 6	Windy P. M. and all night

Remarkable Phenomena.— Halo around the moon on the evening of the 21st.— Continued several hours. Same on the evening of the 23d, from 7 till 11 o'clock.

The ice on the Missouri broke and commenced moving on the 29th February; but a few days after it blocked up and continued stationary until the 14th of the present month, when it began to move again; and on the 18th it was entirely open and clear of ice. In this register an extra column is added, containing the daily rise or fall of

[lxiii] *for the Month of* MARCH, 1820

BAROMETER			MODIFICATIONS AND COURSES OF CLOUDS					
			Morning		Mid-Day		Evening	
Morning	Noon	Evening	Clouds	Courses	Clouds	Courses	Clouds	Courses
29.27	29.27	29.50	Fair	—	Fair	—	Fair	—
29.42	29.10	29.00	C,	N. W.	Cs,	—	C,	—
28.90	28.90	28.94	Ns,	N. N. E.	Cml,	N. N. E.	Cml,	—
28.67	28.84	28.84	C,	—	C,	—	Cs,	—
28.88	28.75	28.86	Fair	—	C,	N. W.	Cs,	N.
29.14	29.04	29.12	Cs.	—	Cml,	N. E.	C,	—
29.16	29.10	29.16	Fair	—	Fair	—	Fair	—
29.32	29.18	29.20	Fair	—	Fair	—	Fair	—
29.14	28.96	28.98	Fair	—	Fair	—	Cs,	—
29.20	29.18	29.18	Cs,	S. E.	Ns.	—	Ns.	—
29.20	29.14	29.00	Ns.	—	Ns.	—	Ns.	—
28.95	28.80	28.74	Ns. S	—	Ns.	—	Ns.	—
28.74	28.62	28.55	Ns. S	—	Cs,	—	Ns,	—
28.76	28.67	28.67	Cml,	N. N. W.	Cml,	N. N. W.	Cml,	N. N. W.
28.89	28.81	28.84	Cs.	W. N. W.	Cs.	W. N. W.	Cs,	W. N. W.
28.94	28.72	28.77	Fair	—	Cml,	—	Cml,	—
29.05	28.90	28.90	Cs	N. N. W.	Cs,	N. N. W.	Cs,	—
28.82	28.60	28.50	Fair	—	C,	—	Cs,	—
28.75	28.75	28.88	Ns.	—	Ns.	—	Cml,	W.
29.10	28.90	28.83	Fair	—	Cml.	N.	Cml,	N.
28.88	28.74	28.48	Fair	—	C,	—	C,	—
28.38	28.25	28.49	C,	N. W.	C,	W.	Cml,	—
28.58	28.26	28.20	Cs.	—	Cs.	S. E.	Cs,	W.
28.30	28.30	28.40	Cs,	S. W.	Ns.	—	Cml,	—
28.62	28.52	28.50	Ns.	—	Ns.	—	Cs,	S.
28.31	28.37	28.60	Ns.	—	Ns.	—	Cml,	—
28.90	28.90	28.90	Cs,	—	Cs.	—	Cs.	—
28.87	28.91	29.02	Cml,	—	Ns,	E.	Cs.	—
29.27	29.30	29.28	Cml,	N. W.	Cml,	—	Cml,	—
29.03	28.89	28.72	C,	N. W.	Fair	—	Cml,	W.
28.53	28.60	28.34	Fair	—	C, Cs,	—	Cs.	—

the river. The sign — denotes the fall of the water during the last twenty-four hours, and the sign + denotes its rise during the same length of time. When the register was commenced the river was three feet above the low-water mark, or its lowest stage in the winter. Therefore on the 25th, when it was highest this month, it was thirteen feet five inches above its lowest stage in the winter.

[lxiv] *Meteorological Register*

Day of Month	MORNING		MID-DAY		EVENING				AT ENGINEER CANTONMENT
	Temperature	Wind	Temperature	Wind	Temperature	Wind	Mean Temp.	Mean Temp. at Germantown	Rise or fall of Missouri in the last 24 hours: Inc.	REMARKS
1	29	N. N. E.	28	N. W.	20	N. W.	25	52	+ 5	A light snow fell to-day
2	15	N. N. E.	38	N. W.	27	N. W.	24	32	— 7	Geese, &c. flying S. to-day
3	14	Calm	41	S. E.	46	E.	33	—	— 3	Large frost last night
4	40	W. N. W.	64	N. W.	51	N. W.	51	—	+12	Strong wind
5	29	N. W.	59	N. W.	49	Calm	45	—	+22	Strong wind
6	41	S. E.	65	N. W.	55	N. W.	53	—	+ 5	Very windy. Large hail fell before sun-rise
7	41	N. W.	65	N. W.	52	N. W.	52	44	— 9	Windy. Light sprinkle of rain this afternoon
8	32	Calm	57	N. W.	47	N. W.	45	46	0	Strong wind
9	40	S. E.	76	S. E.	70	S. E.	62	47	0	Windy
10	50	S.	79	S.	69	N. W.	66	57	+28	Geese flying N.Strong wind
11	49	N. W.	69	N. W.	59	N. W.	59	—	+12	Strong wind
12	35	S. E.	65	S. E.	64	Calm	54	56	+14	Very strong wind
13	48	S. E.	80	S. E.	72	S. E.	66	52	—12	Lt.in N.and N.W. Windy
14	50	S. E.	68	S. E.	70	Calm	62	54	—16	Rain and thunder in aftern.
15	51	S. E.	71	S. E.	72	S. E.	64	55	— 7½	Fresh wind.Lightn.in N.W
16	49	S. E.	62	S. E.	64	S. E.	58	49	— 4	Rainy
17	50	S. E.	66	S. E.	79	S. E.	65		— 4½	Lightning last night
18	53	S. E.	82	S. E.	82	S.	72		— 5½	Fresh wind
19	63	S.	79	S. E.					— 3	Strong wind
20	59	S.	65	S. E.	62	Calm	62		— 2½	Strong wind
21	54	S. E.	71	N. W.	74	N. W.	66		— 3	Fresh breeze
22	55	N. W.	76	S. E.	70	N. W.	67		— 3	Wind very strong at mid-day
23	58	S. E.	84	S. E.	83	S. E.	75		0	Strong wind
24	65	S. E.	79	S. E.	80	E. S. E.	74		— 2	Fresh wind. Violent rain and hail storm after sun-set, ⅓ inch rain in one hour
25	50	N. W.	52	N. W.	57	N. W.	53		— ½	Rain to-day
26	42	N. W.	63	N. W.	67	N. W.	57		— 3	Fresh breeze
27	49	N. W.	67	E. N. E.	69	E.	61		— 2½	
28	53	S. E.	59	S. E.	64	S. E.	58		— 1½	Fresh wind in morning
29	53	S. E.	65	E. S. E.	67	E. S. E.	61		— ½	
30	56	S. E.	68	E.	70	E. S. E.	64		— 8½	

Remarkable Phenomena.— 20th, Halo and Corona around the moon.

In the hail storm of the 24th, hail stones fell of a very large size. One of the largest seen here was of the following dimensions, viz. length 2 inches, breadth 1½ inches, depth 1⅛ inches.

[lxv] *for the Month of* APRIL, 1820

BAROMETER			MODIFICATIONS AND COURSES OF CLOUDS					
			Morning		Mid-Day		Evening	
Morning	Noon	Evening	Clouds	Courses	Clouds	Courses	Clouds	Courses
29.00	29.03	29.10	Ns.	—	Ns.	—	Cs.	—
29.16	29.08	29.10	Fair	—	Cs.	—	Fair	—
29.08	28.90	28.70	Fair	—	Fair	—	Cs,	—
28.30	28.38	28.56	Cs,	—	Cml,	N. W.	Fair	—
28.56	28.70	28.80	Fair	—	Cml,	—	C,	N. W.
28.60	28.30	28.40	Cs.	—	Cs.	—	Cs.	—
28.45	28.56	28.73	Fair	—	Cm,	N. W.	Ns.	—
28.94	28.75	28.84	Fair	—	C,	—	Cs,	—
28.66	28.36	28.10	C,	—	Fair	—	Fair	—
28.00	27.44	27.50	C, Cm,	W. N. W.	C,	N. W.	Cml,	N. W.
28.32	28.32	28.39	C,	—	Cs,	—	Cs,	N. W.
28.48	27.94	28.35	Cml,	—	Cml,	S. W.	Cml,	S. W.
28.30	28.00	28.00	Cml,	N. W.	—	—	Cs, Cm,	S. W.
28.25	28.05	27.90	Ns,	S.	Ns.	—	Cs,	—
28.20	28.10	28.10	Cml,	S. W.	Cml,	—	Ns.	—
28.40	28.25	28.20	Ns.	N. E.	Ns.	N. E.	Cs.	—
28.23	28.05	27.96	Ns.	—	Ns.	—	Cml,	—
28.03	27.60	27.72	Fair	—	Fair	—	Cml,	S.W.
27.40	27.40		Cs.	—	Cs.	—	Cml,	—
28.30	28.30	28.33	Cs,	—	Cs,	—	Cs,	—
28.40	28.20	28.10	Fair	—	Cml,	—	Cs,	—
28.40	27.94	28.08	Fair	—	Cs,	—	Cs,	—
28.25	27.60	27.15	C,	—	—	—	Cml,	—
27.97	27.76	27.77	Cml, Cs,	—	Cs,	—	Cs.	—
28.54	28.60	28.50	Cs.	—	Cs,	—	C,	—
28.62	28.41	28.26	Fair	—	—	—	—	—
28.59	28.31	28.24	C,	—	—	—	—	—
28.68	28.50	28.52	Cs.	—	Fair	—	Fair	—
28.76	28.54	28.50	Cs.	—	Fair	—	Fair	—
28.89	28.65	28.53	Cml,	—	—	—	—	—

April 16th, Fall of rain 3-10 inch.

[lxvi] *Meteorological Register*

Day of Month	MORNING		MID-DAY		EVENING		Mean Temp.	Rise or fall of Missouri in the last 24 hours	AT ENGINEER CANTONMENT
	Temperature	Wind	Temperature	Wind	Temperature	Wind		Inc.	REMARKS
1	57	N. W.	74	N. W.	71	N. W.	67	+ 1	
2	54	S. E.	76	S. E.	75	S. E.	68	0	10 P. M. few drops of rain
3	59	S. E.	71	S. E.	67	S. E.	65	— 2½	Fresh wind
4	64	S. E.	66	N. W.	61	N. W.	63	+ 4½	Violent storm last night with thunder and lightning
5	50	N. W.	69	N. W.	70	S. S. E.	64	0	
6	54	S. E.	68	S. E.	70	S. E.	64	+19	
7	40	N. W.	55	N. W.	51	N. W.	48	+26	Rain last night, with thunder and lightning. Strong wind
8	45	S. E.		S. E.	59	S. E.		— 6	
9	51	S. E.	77	N. W.	65	N. W.	64	— 9	
10	53	S. E.	59	N. W.	52	N. W.	54	+19	
11	46	N. W.	61	N. W.	63	Calm	56	+15	
12	56	N. W.	70	N. W.	64	N. W.	63	+ 8	
13	54	N. W.	67	N. W.	62	N. W.	61	— 5	
14	50	N. W.	69	N. W.	64	N. W.	61	— 5	
15	58	S. E.	67	S. E.	66	S. E.	63	— 7	
16	59	S. E.	65	S. E.	61	S. E.	61	— 7	Storm last night of wind, rain, and hail
17	61	S. E.	70	S. E.	68	S. E.	66	— 6	Rain last night, with much wind, thunder and lightning
18	59	S. E.	66	S. E.	66	S. E.	63	— 5	
19	56	S. E.	72	S. E.	68	S. E.	65	— 7	
20	54	S. E.	68	S. E.	69	S. E.	63	— 3	Rainy
21	56	S. E.	76	S. E.	71	S. E.	67	— 6	
22	60	S. E.	77	S. E.	75	S. E.	70	0	Light breezes
23	60	S. E.	83	S. E.	77	Calm	73	+ 5½	
24	67	S. E.	69	S. E.		E.		+14	Rain with high wind this evening. Thunder and lightning
25	53	E.	67	N. E.	59	N. E.	59	— 6	
26	57	N. W.	68	N. W.	62	N. W.	62	—12	
27	50	N. W.	76	N. W.	72	N. W.	66	+ 1	
28	58	N. W.	79	N. W.	68	N. W.	68	+40	Light winds
29								+30	Light winds
30	59	S. E.	73	S. E.	71	S. E.	67	+15	Light winds
31	58	S. E.	66	S. E.	63	S. E.	62	—24	Light winds

May 4th, fall of rain, ½ inch — 10th, 1 inch — 20th, ⅛ inch — 24th, ¾ inch.

[lxvii] *for the Month of* MAY, 1820

BAROMETER			MODIFICATIONS AND COURSES OF CLOUDS					
			Morning		Mid-Day		Evening	
Morning	Noon	Evening	Clouds	Courses	Clouds	Courses	Clouds	Courses
28.80	28.46	28.44	Cs.	—	Cms.Cs.	—	Cs.	—
28.66	28.20	28.18	Cs.	—	Cm,	—	Cs,	—
28.41	28.07	28.07	Cs.	—	Cms.	—	Cs.	—
27.70	27.74	28.03	Ns.	—	Ns,	—	Ns.	—
28.03	28.38	28.33	Cs, C,	—	Cm.	—	Cs,	—
28.59	28.31	28.03	Cs.	—	Cs,	—	Cs,	—
28.23	28.29	28.81	Cm,	—	Cm,	—	Fair	—
28.72		28.53	Cs,	—	C,	W. N. W.	Cs,	—
28.60	28.08	28.37	Cs,	—	Cm,	—	Cml,	—
28.57	28.41	28.50	Ns.	—	Ns.	—	Ns.	—
28.63	28.40	28.40	Ns	—	Cml,	—	Cs,	N. W.
28.25	28.40	28.58	Cs,	N. W.	Cs,	N. W.	Cml,	N. W.
28.26	28.70	28.75	Fair	—	Fair	—	Fair	—
28.91	28.65	28.61	Fair	—	Fair	—	C,	N. W.
28.80	28.63	38.70	Cs.	—	Cml.	—	Cs,	N. W.
28.80	28.73	28.73	Ns,	S. E.	Ns.	S. E.	Ns.	E. S. E.
28.60	28.25	28.30	Ns.	—	Ns,	S. E.	Cml.	S. E.
28.37	28.30	28.24	Ns.	—	Cml.	S. E.	Cml.	S. E.
29.47	28.18	28.26	C,	—	Ns,	S. E.	C,	—
28.47	28.33	28.27	Ns.	S. E.	Ns.	—	Ns.	—
28.27	28.14	28.21	C,	—	C, Cm,	S.	C, Cm,	S.
28.00	28.08	28.15	Fair	—	Cm,	S. W.	Cm,	—
28.22	27.70	27.82	Fair	—	Cm.	—	Cm, Cs,	—
28.02	28.07		C,	—	C. Cs.	—	Ns,	—
28.57	28.57	28.65	Ns.	—	Cml,	—	Cs,	—
28.55	28.68	28.60	Cs,	—	Cml,	N. W.	Fair	—
28.66	28.13	28.22	Fair	—	Cml,	N. W.	Cs, Cm,	—
28.48	28.00	28.29	Cml,	—	Cm.	N. W.	Cm,	—
			Fair	—	Cs.	—	Cm,	—
28.49	28.21	28.31	C,	—	Cms,	—	Cs.	—
28.76	28.47	28.66	C,	—	Cs.	—	Cs,	—

[lxviii] *Meteorological Register*

[*Remarkable Phenomena* continued from page lix [our page 279].]

January 29th. Parhelion around the sun this afternoon, consisting of a halo circumscribing the sun, in the circumference of which appeared the mock suns, and in a horizontal line with the sun. The diameter of the halo was observed to be 45° 20′. To the N. E. of the sun there also appeared a luminous arch inverted, or having its convex part towards the sun, and its extremities directed from it. It was about 60° of a circle of a smaller periphery than the halo, and well defined. The part nearest the sun was found to be 48° 17′ distant from that luminary, so that it did not come in contact with the halo, but the points of their nearest approach were 25° 37′ apart. The halo was indistinct, except in the vicinity of the mock suns, where it was well defined. Time of making observations half past three o'clock, P. M. Thermometer at the same time 5°, Barometer 28.88, atmosphere hazy, thin light clouds about sun, fresh N. W. wind.

This evening soon after the moon rose, there being a thick haze or mist in the atmosphere about her, there appeared two luminous cones of a reddish cast, whose bases coincided with the moon's disc; the one extending with its vertex above the moon directed towards the zenith, and the other with its vertex below her approaching the horizon. At six o'clock the paraselene appeared complete, consisting of the halo of the same diameter as that around the sun this afternoon, the mock moons or images, and the inverted arch to the S. W. of the moon, and of the same size and distance from the moon as that which appeared with the parhelion above mentioned. From each mock moon there projected a cone of light, whose vertices were directed from the moon. Soon after these appeared two more cones issuing from the moon, one on each side of her in a horizontal direction. The length of the one projecting downwards was 8° 40′; that of the other three 2° 30′, they being equal in length. Thermometer when the observations on the moon were made stood at 5°, Barometer 29.00, fresh N. W. breeze, atmosphere hazy, no clouds visible about moon.

January 31st. Parhelion around the sun this morning, consisting of the mock suns only, which appeared soon after sunrise, the distance between them measured 44° 30′

On the 12th the ice in the river was found to be 28 inches thick. Very little current where the measurement was made.

VOCABULARIES

OF

INDIAN LANGUAGES

For the accuracy of the words in the following Vocabularies we have to rely upon the knowledge of the Indians or interpreters from whom we received them, having carefully noted them down on the spot, as they appeared to be pronounced. I have much pleasure in acknowledging the ready and important aid which I received from Mr. John Dougherty, at present Deputy Indian Agent for the Missouri; indeed, the Omawhaw, Shoshone and Upsaroka vocabularies are chiefly set down agreeably to his pronunciation.

The philologist will observe, that in these vocabularies, the guttural sound is indicated by a†, a nasal sound by an *, and a ‡ accompanying the letter j, shows that the French sound of that letter must be given to it.

T. SAY.

	Wah-tok-ta-ta, orOto Language	Konza Language	O-maw-haw Language	Sioux,(Yancton band,) Lang.	Min-ne-ta-re, or Gros ventre Language	Paw-ne Language	Chel-a-ke, or Cherokee Language
Head	na-so	ve-ach-re	pah	pah	an-too	pak-shu	is-ko
Hair	na-to	pa-heu	pa-he	pa-ha	ar-ra	o-shu	ka-tluh
Face	in-ja		in-da	e-ta	e-ta		
Forehead	pa	pah	pa	e-ta-ho	e-re	pak-she-re	a-ga-ta-ga-nuh
Eye	ish-tah	ish-tah	ish-tah	ish-tah	ish-tah	ke-re-ko	a-ka-tuh
Nose	pa-so	pah	(same as *head*)	pa-so	a-pah	tshu-sho	col-yen-suh
Ear	nan-tois	nah-tah	ne-tah	nong-ko-pa	la-hoch-e	at-ka-ro	kad-la-nuh
Lip	e-ha	e-hah	e-hah } same	e-ha			e-a-na-ga-luh
Mouth	e	yeh or eh	e-hah }	ee	e-eep-chap-pah	tska-o	a-ho-le
Chin	e-ko	egh	ra-ba-he	e-ko		ka-ka	kay-en-uh
Tooth	he	heh	ee	he	ee (teeth)	ha-ro	ky-to-ka
Tongue	ra-za	yaa-sah	they-se or tha-se	cha-dzhe	neigh-‡je	ha-to	ka-no-kuh
Beard	e-he	eh-hah-he	e-he	po-te-he	a-poo-te	ra-rosh	a-ha-no-luh
Neck	ta-sha	tah-heu	pa-he (same as *hair*)	ta-ho	a-peh	tshu-she-re	kit-sane or a-git-a-ga-nuh
Skin	ho-ha	whugh-hah	ha	ha	laugh-pa	ska-ret-ke	kan-a-guh
Arm	a-grat-che	ah	ah	is-to	arrough	pe-e-ru	kan-o-gan
Hand	na-wa	sha-geh	nom-ba	na-pa	shan-te	ik-she-re	o-woy-an-e
Fingers	no name for the fingers collectively.	sha-geh-hah	sha-ga	nap-cho-pa	shan-te-ich-po	hash-pet	ta-ka-ya-sut-en
Nail	sha-ga	sha-geh-hu-hah	sha-ga-ha	sha-ka	ich-po	hash-pet	ka-so-kut-un

[lxxi] Leg	ho	sha-gah	naugh-pa-he	ho	eh-ta-whir-ta	kash-o	kun-uns-ka-nuh
Thigh	ra-ga	sha-gah-tun-gah	‡ja-guh	cha-cha	e-re-ke	pe-ka-ta-ko	ka-guh-lung
Foot	ce	seh	se	ce-ha	it-se	ash-o	la-sa-ta-nuh
Toes	no name for the toes collectively	se-hah	se-pa	ces-has-ta	it-se-shan-ke	ash-o-hash-pet	ta-ka-na-sut-uh
Copulation	wa-to		wat-che	tow-e-tong	e-e-pe		
Penis	ra	shang-a	‡ja	cha	e-re	car-e-o	a-tuh
Vulva	o-ya		e-‡ja	so-so	sher-rah		
Meat	ta-to-ka	ta-do-kah	ta-no-ka	ta-do	cu-ruc-tschit-te	ke-shat-ske	o-we-duh
Blood	wa-pa-ga	wah-pe	*wa-me	oua	eh-re	ha-to	ke-kuh
Heart	nan-tcha	na-cha	naun-da	shan-ta	nah-tah	pet-so	o-noh-hwa
Bone	wa-ho	wa-heu	*y-he	ho, same as leg	e-rouh	ke-sho	ko-luh
Horn	cha-ha	hah	ha	heh or ha	an-‡je	are-ko	hu-lon-uh
Magician	wah-ho-ben-ne		ne-ka-shing-guh-ho-ba				
Chief	wang-a-ge-he		ne-ka-ga-he				
Man	wah-she-ga	ne-kos-shing-goh	no	we-cha-sha	mat-tza	tsa-e-ksh	ski-yuh
Old man	wa-sha-in-ga		ish-a-ga	we-chach-chah	e-tan-ca		
Soldier	moi-a-ke-ta		wa-na-sha				
Woman	nah-hak-ka	wa-kooh	wa-o	we-ah	me-ya	tsa-pat	ka-yuh
Old woman	na-ak-shin-ya		wa-o-‡jin-guh	wa-konk-ka	ga-no		
Boy	chin-to-ing-ya	she-do-shing-goh	no-‡jing-ga	ho-ke-she-na	shi-kan-‡ja	pesh-ke	at-so-zuh
Friend	in-tar-ro		ca-ga				
Girl	che-me-ing-ya	she-me-shing-goh	me-‡jing-ga	we-chin-cha-no	me-ya-kan-‡ja	tcho-ra-ksh	a-ga-hew-tzuh
Father	an-tcha	e-tah-cheh	da-da or da-da-ha	at-cu-cu	tan-ta	a-te-ash	a-to-tuh

	Wah-tok-ta-ta, or Oto Language	Konza Language	O-maw-haw Language	Sioux,(Yancton band,) Lang.	Min-ne-ta-re, or Gros ventre Language	Paw-ne Language	Chel-a-ke, or Cherokee Language
Mother	e-hong, the mother	e-nah	e-hong, the mother	hu-co	e-ka	a-te-rah	a-tsing
Son	e-ing-ya,the son	(See Boy)	e-‡jing-ga, his son	che-het-co	mou-ri-sha	pe-rou-ta-ta	a-quat-se-at-su-tsuh
Daughter	e-ong-a, the daughter	(See Girl)	e-‡jong-ga, the daughter	we-tach-nong	ma-cath	tcho-ra-ge-la-ha	a-quat-se-a-ga-ho-tsuh
Pretty	o-com-pe		o-com-pe	o-yuk-co-pe	e-ta-suk-es		
Ugly	o-com-pish-con-na		o-com-pe-a-‡ja	o-yuk-she-sha	e-ta-e-she-es		
Child	che-ching-a	shing-goh-shing-goh	shinga-shinga	ok-che-cho-pa	man-on-gah, children	pe-rou	a-kah
Brother	e-ena,elder brother e-song-a,younger brother	wes-son-gah	we-son-gah, younger brother ‡je-na-ha, elder brother	ho-cowng-‡je-co-che-a, my elder brother	be-a-cah, elder Mat-tso-ga, younger	e-ra-re	a-ke-ne-le
Sister	e-tong-a,younger sister	wet-ton-geh	toing-ga	tow-in-och-te	mat-to-me-ya elder, mat-tak-ke-e-‡je,younger	e-ta-†he	ang-ga-tuh
God	e-onuh,elder do wah-con-dah — they call the thunder the same	wak-kon-doh	wah-con-da	wa-ca-tun-ca, the Great Spirit	man-ho-pa, Great Spirit	tlou-wa-hot, Master of Life	ka-long-la-te-e-geth-te-ra, the Great Spirit above

[lxxiii] Devil	wah-con-dah-pish-co-na, bad god	wok-kon-doh-pe-she, bad spirit	ish-ten-e-ke, bad spirit or witch	wa-con-she-cheh, bad spirit	no corresponding word	tsa-he-ksh-ka-ko-hra-wah, bad spirit	ske-nuh
Heaven	wah-noh-a-tche nuh, town of spirits	no corresponding word; wah-nahk-he-o-shonge-yah-re —road of the dead	wa-noch-a-te, town of brave and generous spirits	wan-ach-a-te-pa, house of spirits	a-pah-he, good village	tska-o, same as mouth	ka-lang-a-te
Hell	no name for this	no corresponding word in this language; o-shon-geh-pe-she — bad road	wa-noch-a-tow-woin-pa-‡je, town of poor or useless spirits	no word for this	no corresponding word	ka-ko-hre-a-to-ro, bad road	tsens-ske-nuh
Heat	tah-an-ah	mos-cheh	on-a-bre	oh-de-de-ta	ar-rase	tou-ets-to	telh-kuh
Cold	sne	sne-wah-cheh	sne	sne	ce-re-a	ta-pech-e	uh-lan-nuh
Rain	ne-yu	ne-she-hue-ah	naun-she	ma-ha-‡jou	†har-a	tat-so-ro	a-ga-skuh
Snow	pah	pah-hue-ah	mah	wah	mah-pa	to-sha	an-tsink
Ice	no-ha†	nah-heh	no-ha	cha-†hah	me-†roh-†he	la-she-to	un-a-ster-lang
Hail	pa-so		ma-se	was-so	mah-pe-ich-te-et-snow large har-a-a-pa rain together		the same as ice
Summer	to-ka		no-gah	min-to-ca-to	ma-pus-a-gus	le-at	ko-ke
Winter	pa-ne		mah-ra-dong	wah-ne-ah-to	ma-la	pitsh-e-kat	ko-luh
Morning	ha-ro-tach-tche		cas-aht-te	he-han-na	ker-aug-co-tah	ka-ka-rush-ka	so-nah-leh
Evening	eh-ta-na		paz-za	eh-ti-a-to	oh-pah	wa-tate-kat-tate-ke-a	son-e-a-leh

	Wah-tok-ta-ta, or Oto Language	Konza Language	O-maw-haw Language	Sioux,(Yancton band,) Lang.	Min-ne-ta-re, or Gros ventre Language	Paw-ne Language	Chel-a-ke, or Cherokee Language
Day	hang-wa		om-bah	aung-pa	mah-pah, very like snow	shak-o-ro e-sha-ret	e-kum
Night	hang-ha		hon-da	ha-*ha-pe	oh-se-us	e-ra-shu-a-te	son-o-yeh
Sun	pe		me-na-ca-ja	oue	mah-pe-me-ne, sun of day	sha-ko-ro	na-toh
Moon	pe-tang-wa, sun that gives light		me-om-bah	ha-ya-to-we	oh-se-a-me-ne, sun of night	pa	as sun, dist. by adding *night*
Star	pe-kah-ha		me-ca-a	weh-chah-pe	e-kah	o-pe-ret	noh-kos-a
Earth	ma-ha		mon-e-ka	mong-ca	a-mah	o-ra-ro	ka-tun
Water	ne		ne	me-ne	me-ne	ket-so	a-muh, nearly the same as *salt*
Whiskey	pa-je-ne		pa-ge-ne				
Medicine	man-cong		uc-cong				
Mysterious medicine	wah-ho-ne-ta		†ho-ba				
Fire	pa-ja		pa-da	pa-ta	be-ras	la-te-to	at-se-luh
Wood	na		‡jan	cha*	be-ra	la-gish, forest	at-uh
Tree	na-bo-shra-ja, standing wood		†her-a-ba-me	cha-on-ge-na, one wood alone	be-ra-ech-te-et		hu-kuh
Bean	o-ne		him-bar-rin-ga				
Leaf	nah-wa		a-ba	wah†-pa	a-pa-bat-to-se	lets-ko-shu	u-guh-lo-kuh
Maize	wa-to-ja		wat-tan-ze				
Pumpkin	wat-twoing		wat-tang				

[lxxv] Bark	na-ha	‡joh-noh-hah	chang-ha	es-sche	la-vet-ta-te	u-tha-lu-kuh
Tobacco	ra-ne	ne-ne	chan-te	ow-pa		
Hazlenuts	qua-ing-ya	*a-‡jin-guh				
Hill	o-ha	pa-ha	†ha-a-ca	avo-ca-ve-car-ish-ta	pa-ho-ke-ve-to	
Valley	a-bras-ka	o-‡je-nosh-ka	se-mong-ca	a-man-she-e-pe, a bushy ravine	la-kat-tosh, a ravine	oh-tat-luh
River	nesh-noug-a, running water	wa-tish-ka	wa-co-pa	an-ge	kat-tosh	ak-wo-ne
Spring	ne-wa-bru, water springing up	ne-hun-ga	cak-ce-za	ma-ha	kets-pa-le,	a-muk-a-nu-go-guh
Gelding	shong-a?	shong-ga-son-ga-en-ne	shon-ko-wa-cong	it-ze-mat-shu-ga		
Horse	shong-to-ka?	shon-ga-tun-ga	shong-min-to-ca	an-‡ju-ca-ba-tu	a-ro-sha	tsa-wil-e
Mare	shong-ming-ya	shon-ga-min-ga	shong-we-a-nong	be-ca	a-sha-tsa-pat	
Colt	shong-shing-ya	shon-to-‡jin-guh	shong-che-cha-na	it-ze-bu-zu-ga-non-ga		
Dog	shong-o-ka-ne, unmeaninghorse	she-no-ta	shon-ka	mat-shu-ga	a-sha-kish	ke-leh
Wolf	shong-tung	shong-tun-guh	shunk-to-ka-cheh	sa-‡ja		
Fox	mes-ra-ka	ma-nik-o-shier	cha-to-ka-na	ih-hoc-ca-‡je		
Bird	wa-ing-ya	wash-ing-guh	ze-ca-no	sa-can-ga	le-kot-ske	ses-quah
Turkey	wa-ek-kung-ja	ze-ze-kah				
War eagle	he-ra	†he-ra-ska				
Buck elk		om-pa-nu-gah	heh-ha-ka	ma-ron-ga-ca-re-pe		
Doe		om-pa-min-gah	o-pong	ma-ron-ga-be-ca		

	Wah-tok-ta-ta, or Oto Language	Konza Language	O-maw-haw Language	Sioux, (Yancton band,) Lang.	Min-ne-ta-re, or Gros ventre Language	Paw-ne Language	Chel-a-ke, or Cherokee Language
Egg	e-tcha	et-tah	wa-tuh	weet-ca	sa-can-ga-non-ga	le-kot-ske-pe-ko	o-a-teh
Buck deer			toch-ta-nu-gah	ta-min-do-ca	se-e-ka-tuc-ke		
Doe			toch-ta-min-gah	ta-we-a-nong	se-e-ka-tuc-ke-be-ca		
Fawn			toch-ta-‡jinguh-hin-gara-‡ja	ta-che-cha-na	se-e-ka-tuc-ke-non-ga		
Fish	ho	ho	ho-ho	ho-hung	bo-a	kat-tsche-ke	at-tsa-teh
Squirrel	ah-sin-ya		sin-guh				
Prairie dog	man-ne-ho-ja		man-ne-†ho-da				
Snake	wa-cong	vatz-ah	wais-uh	wam-dosh-ka	ma-buc-sha	lot-pat-set	e-nah-tah
Bison	cha		ta		ke-e-ra-pe		
Otter	tosh-nong-ya		nosh-noh	pet-tong	me-ra-po-ca		
Black tailed deer	ta-sa-wa		toch-ta-sin-ja-sa-ba				
Bear	mon-ja	was-sah-ba	was-sa-ba	wa-hunk-ca-ce-cha	lah-pet-ze	ko-roksh	yoh-nuh
Raccoon	me-ka		me-ca	we-cha			
Beaver	ra-way		‡ja-ba	cha-pa	me-ra-pa		
Louse	ha	hah	ha	ha-uh	a-tap-peh	pets	ta-nuh
Antelope	ta-to		ta-tshu-guh				
Skunk	mon-ka		mon-guh				

[lxxvii] Flea	ta-gres-ka, deer that is going	no corresponding word	tat-a-guh, fool deer	ha-nuh	sa-cas-ke	te-ra-guh	tsu-kuh
Muskrat	o-to-ak-ka		sin-ja-sna-ja-wa-ge-re				
Rabbit	mish-tsching-ya		mas-tschin-ga	mash-te-cha-nong	e-ta-ke		
Bow	man-to	shah-me-ja	man-da-san-ra	e-ta-ze-pah	be-rah-hah	te-ra-gish	kelk-tsut-e
Arrow	ma	mah	mah	wang-hink-a-pa	e-tah	lek-sho	kun-e
Knife	ma-he		ma-he	me-na	mat-ze		
Pipe	ra-no-wa		ne-ne-bah	chan-dow-ho-pa	eh-ke-pe		
Canoe	pa-ja	pah-cheh	mon-de-ha-shin-ga	wa-tah	a-man-ta	lak-o-ho-ro	tse-u
House	che	teh	te	te-pe	a-te, Ind. lodge	ak-ka-ro	kat-so-da
Copper	ma-za-ze	mahs-es-se-he	mon-za-‡je-da	mas-ah-shah, or red iron	o-was-sa-she-re	kots-ter-ra-ha	tsal-ya-tal-ou-i-ka, red brass
Stone	eng-ro	eh	e-eh	e-yong	me-e	ka-ret-ke	ni-yah
Body	e-ro						
Iron	ma-za	mahs-suh	mon-za	ma-ah	o-was-sa	pa-bet-de-sho	u-tal-u-gis-ke
Yes	Hon-ja	hoo-eh	oh-hoh*	hah or toch	i, or ar-roch-o-bah	na-wa	o-wah
No	He-a-ko, by the men He-a-ka, by the squaws	hank-kash-eh	auns-kash-a	he-yah	na-‡jes	ka-ke	an-tleh
None	ning-ya		ning-ga				
White	ska	skoh	ska	scah	ho-tech-ke	la-ta-ka	u-na-kuh
Red	shu-ja		‡je-da	shah	ish-she		
Black	sa-wa	sah-beh	sah-ba	sa-pah	shu-pe-sha	ka-tet	un-nuh-ga
Blue	to		to	toe	ta-he		
Yellow	ze		ze	ze	she-re		

	Wah-tok-ta-ta, orOto Language	Konza Language	O-maw-haw Language	Sioux,(Yancton band,) Lang.	Min-ne-ta-re, or Gros ventre Language	Paw-ne Language	Chel-a-ke, or Cherokee Language
Light	ta-kong	haum-pah	o-go-om-ba	oh-‡ja-‡jo	mah-pa-suh-kas	shuk-she-gat	e-ga-hew
Darkness	o-han-za	haum-o-pas-se	o-ga-ha-no-pa-sa we	oh-yok ka-pa-za	oh-pa-‡je	same as night	ul-se-kuh
Me	me-eh			me-ya			
I (*ego*)		be-ah			me-e	ta	i-yeh
One	yon-ka	me-akh-che	me-ach-che	wan-cha	le-mois-so	as-ko	
Two	no-wa	nom-pah	nom-ba	no-pa	no-o-pah	pet-ko	
Three	ta-ne	yah-be-re	ra-be-ne	ya-me-ne	na-me	tou-wet	
Four	to-wa	toh-pah	to-ba	to-pah	to-pah	shke-tiksh	
Five	sa-ta	sah-tah	sat-ta	zap-ta	che-†hoh	she-oksh	
Six	sha-qua	shahp-peh	shap-pa	shak-pa	a-ca-ma	shek-sha-bish	
Seven	shah-a-muh	pa-om-bah	pa-num-ba	shak-o-e	chap-po	pet-ko-shek-sha-bish	
Eight	kra-ra-ba-na	pa-yah-be-re	pa-ra-be-ne	shak-un-do-huh	no-pup-pe	tou-wet-sha-bish	
Nine	shan-ka	shank-kuh	shon-ka	nuh-pet-che-wung-kuh	no-was-sap-pa	lok-she-re-wa	
Ten	kra-ba-nuh	kera-brah, or ker-a-be-rah	kra-ba-ra	wek-chem-in-uh	pe-ra-gas	lok-she-re	
Eleven	a-gen-ne-yon-ka	ah-re-me-akh-che	a-gar-e-me	a-ka-ong-‡jin	a-pe-le-mois-so	as-ko-lok-she-re	
Twelve	a-gen-ne-no-wa	ah-re-nom-pah	a-gar-e-num-ba	a-ka-no-pa	a-pe-no-o-pah	pet-ko-sho-she-re	

Having but a small number of words of the two following Languages, it is thought proper to insert them separately from the above comparative tables, in order that the columns may not be too much extended.

Shos-ho-ne Language

Good, sant
Bad, kate-sant
Salmon, au-gi
Come, ke-ma
Large, pe-up
Big river, pau-pe-up
To eat, bo-re-can
White people, tab-ba-bo — *people of the sun*
Go, nu-me-a-ro
To copulate, yo-co
To see, ma-bo-ne
Did not see it, ka-en-ma-bo-na
To love, kom-muh
A great many, shant
Bison, kot-zo
Antelope, wa-re
Elk, pa-re
Awl, we-u
Beaver, ha-nish
Friend, hants
Woman, wipe
Water, pa
Horse, bunk-o
No, ka-he
Tash-e-pa, pierced nose — *a nation of the Columbia*
Paw-kees, black feet Indians
Pun-ash, root eaters — a band of Shoshones who call a horse to-ish, and a squaw mo-co-ne

Up-sa-ro-ka, or Crow Language

White people, mash-te-se-re — *yellow eyes*
Pawkees or Black-feet,e-chip-e-ta
Poor, bats-ish-cat
Powerful or strong, bats-atsh
Good, e-tschick
Bad, kab-beak
Bison, be-sha
Bison bull, che-ra-pa
Beaver, be-rap-pa
Tobacco, o-pa
Where, sho
Far, ham-a-ta
Mountain, am-a-†ha-ba
Elk, e-che-re-ca-te — *little horse*
Finished or completed, kar-a-ko-tuk
Knife, mit-se
What, sa-pa
Near, ash-ka
Friend, she-ka
To eat, ba-boush-mek
Gunpowder, be-rups-spa
Little, e-ro-ka-ta
Name which they give to the Sioux nation, mar-an-sho-bish-ko — *or the cut throats*
Young woman, me-ka-ta
Water, me-ne
Fire, be-da
Wood, mon-a
River, an-sha
Horse, e-che-ra
No, bar-a-ta

[lxxx] VOCABULARY OF INDIAN LANGUAGES

The following promiscuous words are added for the further information of the philologist.

Wah-tok-ta-ta, or Oto Language

White people, maz-onk-ka — *iron makers*
Americans, ma-he-hun-jeh — *big knife*
British, ra-gar-rash-ing, probably not an Oto word
Ioway nation, pa-ho-ja—*gray snow*
Missouri nation, ne-o-ta-tcha — *those who build a town at the mouth of a river*
Mississippi river, ne-o-hun-je—*the river that enlarges as it runs*, or ne-ber-a-‡je, *water of knowledge*
Missouri river, ne-su-ja — *smoky water*
Osage river, ne-ska—*white water*
Grand river, nesh-na-hun-ja—*big water*
Konzes river, to-pe-o-ka — *good potatoe river*
Nodowa river, ne-a-ton-wa—*jump over river*, or ne-wa-ton
Walk, ma-ne
Distant, har-re
Deer, tah-che
Green, toh-tsche
Platte river, ne-bras-ka — or *flat water*
Little Platte river, ne-breska-ing-ya — *little flat water*
Tarkio river, tar-ke-u
Nemehaw river, ne-mo-ha-hun-ge
Little Nemehaw river, ne-mo-ha-ing-ya
Nishnabatona river, nish-na-bot-ona — *canoe making river*
Weeping water river, ne-ha-ga — *weeping water*
Saline creek, nes-co — *salt water*
Loup fork of the Platte river, Pawneeomawhaw-ne-etow-wa
Elkhorn creek, wa-ta-tung-ya
Konza river, Konza-ne-etow-wa — or *the river belonging to the Konzas*
Run, nong-a
Leap, ta-wa
Fight, a-ke-ra-ga
Eat, wa-ro-ja
Drink, rat-tong
Steal, mo-no
Talk, e-cha
Strength, bre-hra
Weakness, wa-ha-ha
Poor, wa-was-tong
Near, as-ke
Different, e-tan-tong
Good, pe-ay
Bad, pish-co-na
Mockeson, a-ko-je
Gunpowder, ak-ho-je
Ball, ma-za-muh
Looking-glass, ma-zo-ka-tou-a
Long, thra-ja
Short, su-is-cha
Broad, ar-ru-cha-hun-ja
Thick, sho-ga
Thin, bra-ka
Father, in-ko — used by a person when addressing his father. This word is said by Lewis and Clarke, p. 36, to mean *chief*, but this seems to be a mistake.
Twenty, kra-ba-nuh-no-wa
Twenty-one, krabanuhnowa-a-gen-ne-yon-ka?
Thirty, krabanuh-ta-ne
One hundred, krabanuh-ho-yong
One hundred and one, krabanuh-hoyongagenneyonka
One thousand, krabanuhhoyong-hon-ja — or *big hundred*

[lxxxi] VOCABULARY OF INDIAN LANGUAGES

O-maw-haw Language

White people, wah-ha — *makers*
Americans, mah-he-tun-guh —*big knije*
British, suk-an-ash—not a proper Omawhaw word
Hat, wa-ha-pa-ga-rong
Hatchet, maz-za-pa-‡jin-ga
Axe, maz-za-pa-tun-guh
Prairie dog's burrow, man-ne-†ho-da-te
Grizzly bear, mon-tschu
White hare, mas-tschi-ska
Porcupine, pa-he
Bald eagle, he-ra-pa-song
Grey eagle, he-ra-gra ‡je
Black bear, wa-sa-ba
Dragon fly, te-ne-nik-a
Sword, mah-he-tun-guh
Small knife, mah-he-‡jin-guh
Canoe, mun-da
Thunder, †ger-rong
Breech-cloth, ‡ja-a-de-gar-rong
Niece, we-te-‡jeh by the men, we-to-‡jon-ga by the squaws
Brother-in-law, ta-*hong
Deer skin, ta-ha
Sweet maize, wat-tan-ze-ske-ra
Common maize, wat-tan-ze-sar-ra-ga
An ear of maize, wa-ha-ba
Abdomen, ta-ze
Paunch or stomach, ne-ha
Mammæ, mon-za, same as *iron*
People, ne-ka-shing-ga, or ne-kuh-shing-guh
Young warrior, wa-se-se-ga
Warm, mash-ta
Nostrils, pah-shu-sha
Human skin, he-ha
Deep blue, toh-che
Dance, wat-che. Sometimes the word ga-ha, *to make*, is subjoined to this word in order to distinguish from their term for copulation
His child, e-ne-se
Me (I) make, pa-†ha, very like the word for *hill*
My true child, we-se-‡jun-tsche-nu
It is said there is none, ning-ga-um
Bad or ugly, pa-‡juh — a word used in anger, principally by the squaws
Poor as a turkey, wah-pa-ne-ze-ze-ka-a-go
I am as poor as a turkey, a-mah-panezezekaago
You are as poor as a turkey, war-ichpanezezekaago
It was red with blood, wa-me-‡je-da-ka
I will not go, a-bra-muj‡-‡je
Come here, ge-ga-ha
Little Platte river, ne-bras-ka-‡jinguh — *Little flat water*
Konza river, Konza-ne-eta
Bowyer creek, ne-ha-ba—*shallow water*
Little Sioux creek, wa-ta
Run, to-na
Leap, we-sa
Fight, ke-ke-na
Eat, wa-brat-ta
Drink, brat-tong
Steal, mo-no
Talk, e-a, very like *stone*
Strength, wash-ca-tun-ga
Weakness, wa-ha-ha
Poor, wah-pa-ne
Near, ash-ka
Good, o-dong
Bad, o-dong-buj‡-‡je, or o-dan-‡je, or pe-a-‡ja
Mockeson, *han-pa
Gunpowder, mah-†ho-da

VOCABULARY OF INDIAN LANGUAGES

Ball, mah-za-muh
Lookingglass, ne-o-ke-garras-se
Long, sna-da
Short, cha-shkah
Broad, bras-ka
Thick, sho-guh
[lxxxii] Thin, bra-ka
Thirteen, a-gar-e-ra-be-ne
Twenty, kra-ba-ra-nom-ba
Twenty-one, krabaranomba-ke-de-me-ach-che
Thirty, krabara-be-ne
Thirty-one, krabarabene-ke-de-me-ach-che
One hundred, krabara-he-me
One hundred and one, krabarahe-me-ke-de-me-ach-che
One thousand, krabaraheme-tonga
One thousand and one, krabara-he-metonga-kedemeachche
Nine thousand, krabarahemeton-ga-shon-ka

O-maw-haw Names of Persons

MEN

Yellow Belly, ta-ze-ze
Little God, wah-conda-‡jin-ga
God, wah-conda
He that carries his feet, se-ge-e
He that has four feet, se-to-ba
Four hands, nom-ba-to-ba
Two legs, ‡ja-ga-nom-ba
Four nails, sha-ga-to-ba
Big hand, nomba-tun-ga
Big eyes, ish-ta-tun-ga
He who deliberates, wa-ru-ger-rong
Buffaloe rib, ta-re-ta
Buffaloe tail, ta-sin-da
Buffaloe head, ta-pa
Buffaloe bull, ta-nu-ga
Buffaloe calf, ta-‡jin-ga
Little white bear, mut-chu-‡jinga
Black white bear, mut-chu-sa-ba
Black bird, wa-‡jinga-sa-ba
He that walks on the edge, o-hon-ga-mon-e
He that makes signs as he walks, wa-bom-en-e
He that walks behind, a-ga-ha-mo-ne
He that hunts as he walks, o-na-mun-ne
The walking cloud, mah-pe-mun-ne
The strong walker, wash-ka-mun-ne
He who walks when fruit is ripe, se-da-mun-ne
He who cries as he walks, ha-ga-mun-ne
He who walks beyond others, ko-she-ha-mun-ne
He who arrived in haste, wash-con-he
He who is not afraid of tracks, se-gra-na-pa-ba
The white horse, shon-ga-ska
Seven, pa-num-ba
Ace of spades, o-ka-de-ga-rong
Little cook, o-hon-‡jin-ga
Head wind or North wind, ke-ma-ha
Big skunk, mon-ga-tun-ga
Prairie wolf, mon-e-kus-se
Swan, me-hus-ca-tun-ga
He who walks double, nom-ba-mon-ne
Black breast, mon-ga-sab-ba
No hand, nom-ba-ning-ga
Brave, wa-shu-sha
No knife, ma-he-ning-ga

VOCABULARY OF INDIAN LANGUAGES

Two tails, sin-da-num-ba
The top of the tent-poles which are tied together, te-she-mo-ha
Big bullet, ma-ze-mat-tunga
Medicine mouth, e-wa-ho-ba
He who carries real medicines, mac-ca-n-e
Wet mockeson, hom-pa-no-ca
Big leggings, o-tant-tun-ga
Smoke maker, shu-da-goch-ha
Two faces, in-da-nom-ba
The twins, nom-ba-dant
Yellow knife, ma-he-ze

SQUAWS' NAMES

The first moon, me-ta-e
Na-sa-za
[lxxxiii] Village, towoin
Me-hun-guh
First thunder, ti-en-e
Female sun, me-teh-ha
Female moon, me-um-bun-ne
Female axe, mas-up-pa-me
Female deer that looks, wa-tum-bun-ne
The first thunder that falls, ta-ing-ga-ra

O-maw-haw Interjections and Exclamations

Zt! — This is used by the men when contemplating a fine trinket, looking-glass, &c.; they sometimes say zt-o-dah!
Sheh-zt-zt-zt! or wah-zt-zt-zt! or oah-zt-zt-zt! is used by the men for driving dogs out of mischief.
Eh-zt-zt-zt-zt! by the women on the same occasion.
Heh! an inspiration — used by the women when a sudden but trifling accident occurs — as it is also used by the white females.
Ke-a! — the first syllable nasal — by the women for calling their dogs.
Wo-oh! by the men for calling their dogs or horses. It is a sound very similar to that used by the whites to halt horses.
Wah-man-gar-ing-ga! Be off, or go away — spoken in anger — this would be the last word, an attack would succeed if disregarded.
O-hoh! (drawn out very long) used to one who has been troubling them a long time — it would precede the preceding exclamation in the gradation of displeasure.
Ge-ga-ha! wah-ge-ga-ra! o-hoh-ge-gar-a! — the successive expressions of impatience in calling a person to come.
Hi-o! The answer of a squaw to one who calls.
Ha! The answer of a man to one who calls.
Da-dansh-ta-a! An exclamation similar in signification to *O, alas, me!*

[lxxxiv] VOCABULARY OF INDIAN LANGUAGES

Sioux, (Yancton band,) Language

American, me-na-has-hah—*Long knife*
British, sa-kin-da-sha. This appears to be an adopted word.
Physician, wa-pe-a-we-a-cha-sha
Village, o-tong-y-a
Eagle, ho-yah
Green, to-we-toy-ya, or "the blue to dye with"— they have no other word for this colour
Warm, mach-ta
Pawnees, pa-dan-o-ta
Sioux, da-co-ta
Run, e-ong-ka
Leap, e-ep-se-sha
Fight, ke-che-za
Eat, wo-tah
Drink, ya-ta-kong
Talk, e-ah
Good, wash-ta
Gunpowder, cha-hun-da
Thirteen, a-ka-ya-me-ne
Nineteen, a-ka-nuh-pet-che-wung
Twenty, wek-chem-in-eh-nom-pa
Twenty-one, wekcheminehnom-pah-a-ka-ong-ge
Thirty, wekcheminuh-ya-me-ne
Thirty-one, wekcheminuhyame-ne-a-ka-ong-‡jin
One hundred, o-pang-ha
One hundred and one, opangha-a-ka-ong-‡jin
One thousand,kok-o-tong-o-pang-ha
One thousand and one, kokotong-opangha-a-ka-ong-‡jin
Ten thousand, kokotongopangha-wekcheminuh

The upper bands of the Sioux in their pronunciation substitute the letter *l* for the *d*.

Min-ne-ta-re, or Gros ventre Language

American, man-ce-ech-te-et—*Big knife*
British, bo-she-it-to-†chre-shu-pe-sha — *the men who bring black cloth*
French, bo-she
Spaniard, was-she-o-man-ti-qua
Crow Indians, par-is-ca-oh-pan-ga — *the crow people*
Crow Indians, another band, eh-ha-tza — *the people of leaves*
Snake Indians, ma-buc-sho-roch-pan-ga
Flat-headed Indians, a-too-ha-pe
Pierced-nose Indians, a-pa-o-pa
Black foot Indians, it-ze-su-pe-sha
Gros ventre of the Fort prairie, a band of Black feet, a-re-tear-o-pan-ga
Assinniboin Indians, e-tans-ke-pa-se-ta-qua
Shienne Indians, a-was-she-tan-qua, or it-anse-po-‡je
Sauteur Indians, ha-hat-tong
Mandan Indians, a-rach-bo-cu
Rickaree Indians, a-rick-a-ra-one
Sioux Indians, it-ans-ke
Pawnee Loups Indians, sa-‡jer-o-pan-ga
Les Noire Indians, at-te-shu-pe-sha-loh-pan-ga
The Red Shield Chief, one of the principal chiefs, e-tam-ina-geh-iss-sha
The Borgne or One Eye, grand chief, a remarkable man, he was killed by the Red Shield, a few years since, ka-ko-a-kis

[lxxxv] VOCABULARY OF INDIAN LANGUAGES

Missouri river, amanti-a-‡je — *the river that carries canoes*
Little Missouri river, a-manti-ca-‡ja — *the river that carries little canoes*
Yellow Stone River, mit-ze-re-a-‡je — *the river of yellow rocks*
Physician, mat-za-ma-ho-pa
Village, a-ma-teh
Prairie, a-mon-su-ket
Eagle, ich-pro-hich
Arrow point, e-tah-e
Tomahawk, weep-sa-lan-ga
Green, †hau-te-ge
Emasculation, an-ju-ca-da-‡jus
Little wolf, bot-sas
Blanket, wash-a-echre-o-tucke
Mountain, avo-ca-ve
Kill, ta-ha
Die, tas
Scalp, a-ram-pa-tsak-ke
He or she, ne
Bison cow, me-te-ya
A thick forest of small trees, be-ra-she-e-pe
Run, te-re-a
Leap, te-chre
Fight, re-ke
Eat, ma-rou-ta
Drink, be-de-he
Steal, ma-a-shan-re
Talk, de-da
Mockasin, o-pah
Gunpowder, mer-e-ze-ba
Nineteen, a-pe-no-was-sap-pa
Twenty, no-o-pah-pe-ra-gas
Thirty, na-me-a-pe-ra-gas
Forty, to-pah-a-pe-ra-gas
One hundred, pe-ra-gas-ich-te-et
One thousand, pe-re-gas-ich-te-et-a-cah-co-re

Paw-ne Language

Grand Pawnees, tcha-we
Loups or Pawneeomawhaws, ske-re
Pawnee Republicans, ze-ka-ka or ket-ka-kesh
Tappage band, pe-tou-we-ra
Not, buj‡-‡je
Tool Robe, (the republican grand chief), sha-re-a-deeksh-taw-we
Thirteen, tou-wet-lok-she-re
Fourteen, lah-ko-ke-ta
Fifteen, she-oksh-ta-ro-ke-ta
Sixteen, shrou-we-o
Seventeen, tou-wet-ka-ke,(twenty less three)
Eighteen, pet-ko-ka-ke, (twenty less two)
Nineteen, as-ko-ka-ke, (twenty less one)
Twenty, pe-tou-o
Twenty-one, petouo-as-ko
Thirty, luk-she-re-we-tou-o
Thirty-one, luksherewetouo-as-ko
Forty, pet-ko-sho-o-ra-ro
Forty-one, petkoshooraro-as-ko
Fifty, petkoshooralokshere
Sixty, tou-wet-ra-ro
Seventy, touwetralokshere
Seventy-one, touwetralokshere askolokshere
Eighty, shke-tiksh-ta-ro
Eighty-one, shketikshtaroasko
Ninety, shketikshtarolokshere
Ninety-one, shketikshtaroaskolok-shere
One hundred, she-koksh-ta-ro
One thousand, petkoshooralok-shere-tsa-e-ksh
The name of one individual of the Pawnee Loups is "The maker of God."

[lxxxvi] VOCABULARY OF INDIAN LANGUAGES

The two following Vocabularies were taken down by Major Long during his tour on the upper Mississippi in the year 1817

	Winnebago, Puant, or Nippegon	Naudowessies of Carver and Hennepin
Arm	ar-dah	ish-to
Axe	mahs	ontz-pa
Arrow	mah	wah-hen-te-pa
American or Long knife	mah-ek-ha-te	is-son-tah-kah
Brother	sunk-ha-deh	me-son-kah
Beads	wy-a-per-ris-sipe	we-o-ke-a-tah
Bread	wice-kap	ah-ho-e-a-pe
Beaver	nah-a-pah	schah-pah
Bear	ontsh	wah-hank-ce-chah
Brass or copper	mahn-se	mahnz-a-ze
Chief	ongk-pe	wich-ash-tah-yah-top-pe — *good chief*
Canoe or boat	wach	wah-ta
Cards, playing	pek	pek
Child	no-go-nek	oke-che-o-pah
Dead	ah-no	kthah
Deer	tchah	tah-ken-shah
Dog	shonk	shonk-ah
Elk		o-pangh
Elbow	eye-shou-uck	ish-pah
Eyes	shtas-so	ish-tah
Ears	nahnt-shou-ah	nokh-ra
Feet	se	se-hah
Fingers	na-ap	no-pa-to-ka-hah
Fox	cha-ontz-sin-cer-et	shonk-gre-dah
Fire	pyche	pa-tah
Father	cha-che	ah-ta
Face		e-ta
Good	a-pe-no	wash-ta
Garter	o-a-kish-ke	wash-kin-chah-ha
Gun	ish-ok	mahs-ak-khan
Ground	mak-kah	mah-koh-cha
Green	mah-nech-o	tah-ko-te
Grass	khah-weh	pa-zhe
Hands	nah-pur	no-pa
Head	nahs-so	Fak-e
Heart	nach-keh	chan-ta
House or lodge	tche	te-pe

VOCABULARY OF INDIAN LANGUAGES

	Winnebago, Puant, or Nippegon	Naudowessies of Carver and Hennepin
Horse	shonk-hat-ta	shonk-a-wak-kungh
Island	wich	we-tah
Iron	mahs-ish-ah	mahnz-ah
[lxxxvii] Indian	wank-shich	ik-e-cha-wich-ash-ta
Knife	mah-he	es-sanh
Lead	ish-o-co-mah	mahnz-as-so
Legs	o-rah	ho
Louse	ha-dah	hah-yur
Maize	wa-cho-as	wah-me-nah-zah
Man	wank-she-grah	wich-ash-tah
Mother	nah-ne	e-nah
Musket	shou-uck	sin-te-pah
Meat	tchack	tun-do
Meal	wois-top	ah-ho-e-ap-pe
Mockasin	wa-co-cheh	ham-pah
Moon	hah-heh-we	we?
Mouth	e	e?
Mosquetto	nah-wonk	chah-pon-gah
No, or nothing	chonch-que-ne-no	he-yah
Nose	pah	pagh-ra
Oar, or paddle	nash-uck	wa-me-nah-he-chah
Old	ah-chin-shun	wich-a-hin-chah, *old man*
Otter	to-shen-uk	ptungh
Owl	wahk-cheh-he	e-angh-kah-hah
Powder	ok-hun-ne	chah-hun-de
Pond or lake	tah-hat-ta	min-da, or tong-gah
Porcupine	wah-hane	
Pipe	tah-ne-ho	chan-do-o-pah
Road	nak-koh	chang-ko
River	ne-shan-nuk	wah-te-pah
Red	was-seh	shah
Sister	nok-ach-ap-pe-tah	tunk-she
Silver	sho-de-ah	manz-as-kah
Squaw	he-no-ko-tah	win-o-khe-jah
Sun	we-dah	we?
Star	kah-dach-o	wich-anck-pe
Thunder	wah-kon-jah	wak-ke-ah
Tree	nah-nah	chah
Town or village	mah-ket-te-che-nuk	ah-tong-wa
Tobacco	tah-ne-nah	chan-de

VOCABULARY OF INDIAN LANGUAGES

	Winnebago, Puant, or Nippegon	Naudowessies of Carver and Hennepin
Teeth	he	e?
Universe	han-najh-pe	ah-was-se
Wax	i-sic-we-ke-ne-chah	tok-mah-hah-ses-sen-de
White	skah	skah
Water	ne-nah, or neh	men-neh
You	ne-eh	ne-ya
[lxxxviii] Yes	on-chah	hah
One	jhing-ke-de	wan-chah
Two	nope	nom-pah
Three	tah-ne	yah-men-ne
Four	chope	toh-o-pah
Five	sach	sah-pe-tah
Six	kuh-we	shahk-pe
Seven	sha-ko	shahk-o-win
Eight	no-wunk	shah-hun-da-hah
Nine	jhink-ich-os-co-ne	nop-cheh-wunk-kah
Ten	kher-a-pun	we-ke-cha-me-nah
Eleven	jhink-he-ra-sho-ne	ak-ka-wun-ghe
Twelve	nope-ash-o-ne	ak-ka-nume

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